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HOROLOGY.

PHILOSOPHICAL DISSERTATION.

AS this journal is intended to deal with information, both scientific and practical, in relation to the different interests concerned, we have deemed it best to begin at the beginning, at least so far as the principles and practice of time-keeping are concerned. There are few persons of an intelligent turn of mind—and who is not of an intelligent turn of mind in these days?—who do not exhibit an ardent curiosity about everything connected with the origin and progressive phases of that which the poet, as well as our own experience, tells us wears through the roughest day. Ever since man began to move about on the face of the earth he has been, by the force of natural law, an observant and influenced being of the highest organization of Morning, Noon, and Night. The opening dawn, the bright mid-day, and the starry eve, have all in turn acted upon him, and excited his most profound attention. He could plainly note the varying seasons changing the face of nature, and, as he advanced in what we may term instinctive knowledge, he looked at the heavens, and mapped out for himself the germs of the first outlines of astronomy. From these, as a reasoning consequence, horology, in whatever language he first expressed it, would be deduced. He would soon discover that the motions of the heavenly bodies regulated the motions of his own; his rising, his life-sustaining labour, and his laying him down to rest, with all that appertained unto them.

"Night's swift dragons cut the clouds full fast,
And yonder shines Aurora's harbinger."

"The grey-eyed morn smiles on the frowning night,
Check'ring the eastern clouds with streaks of light."

"The morn, in russet mantle clad,
Walks o'er the dew of yon high eastern hill."

"But yonder comes the powerful King of I
Rejoicing in the East. The lessening clo
The kindling azure, and the mountain's b
Illum'd with fluid gold—"

"Tis raging noon; and, vertical, the sun
Darts on the head direct his forceful rays.
O'er heaven and earth, far as the ranging eye
Can sweep, a dazzling deluge reigns—"

"Night, sable goddess! from her ebon throne,
In rayless majesty, now stretches forth
Her leaden sceptre o'er a slumb'ring world:
Silence, how dead! and darkness, how profound!
Nor eye, nor list'ning ear, an object finds;
Creation sleeps."

If the reader will devote a few moments to the study of the above quotations he will easily be able to connect the ideas there given with the early dawn of horological science. They are from various authors, and they beautifully, and most powerfully, express such thoughts as man might have given utterance to in those ages of his existence when there were neither clocks, watches, nor dials, and when the calculations of latitudes, longitudes, and astronomical places were not; although transits, eclipses, and all the other

heavenly phenomena went on as usual, and of which we shall have occasion to speak.

The most ancient known mode of dividing the day and night was, undoubtedly, the most natural one; namely, by the motion of the sun and the stars. Nor is this entirely unpractised even in the present day. In various parts of Europe, and in the colonies, the inhabitants of country districts are able, on clear days and nights, to tell the time with an accuracy sufficient for their wants, and that would make time-keepers seem almost a superfluous luxury. Give them a clear night, and a well-tryed "weather almanack," no matter how many years old—one that the moon stands well by—and the unsophisticated peasant is steel-proof against your modern "new-fangled kickshaws" of chronometers and astronomical regulators. In these northern latitudes we are all familiar with the astronomical constellation called *Ursa major*; it is also familiarly known by the names of "Charles's wain," the "Wagon and horses," the "Plough," and "Great Bear." This constellation is composed of seven stars, all of which, when looked at, would suggest a wagon and horses, or a plough. They revolve round the northern pole-star, and, to a practical watcher, will indicate pretty closely the time of night. They may be easily discovered in this way. Looking high up in a northerly direction, two bright stars will be seen, nearly in a direct line with a small, but very bright one. This bright one is the North-Polar Star, and the other two are called "the pointers," as they point to it. Opposite to these "pointers" are two other stars, forming somewhat the figure of a square. Tailing away from the last-named stars are three others, which may be termed the "team," and with which are traced the outline of the "Plough," or the "Wagon and horses," according to the star-gazer's fancy. We are not going to trouble the reader with the astronomical names of these stars, which names are all in Greek, but direct attention to the following diagram, by carefully studying which on a clear night, the bucolic mind far from the hum of cities, the stroke of church bell, or the Dutchman's tick, can tell "what of the night."

The subjoined explanation will be understood by the reader.



P, in the centre, is the North-Polar Star; and *p, p, p, p*, are the pointer stars of the constellation already mentioned. An evening's watching of these stars will be found most interesting both astronomically and in respect to the value set upon them for time-keeping purposes by country people. The seasons make no difference in their orbital position, as they move in the same path summer and winter, and year after year; and, probably, have done so since the creation of the Universe. The distance between the two pointers is about one-fifth of the distance between the lowest one and the Pole-star itself, and the last-named star may be taken, for all but scientific purposes, to be the turning-point of the heavens. Being so near that point as the "Plough" is, it consequently describes but a very small circle round it in its diurnal rotation.

As the stars are brightest in winter, and can be seen so early on account of the shortness of the days, that season of the year is the best for looking at them. About five or six o'clock on a frosty evening the pointers of the "Plough" will be seen underneath the Pole-star, corresponding to the place marked A in the diagram, the

"team," or the three star-horses, tailing to the west. About midnight they will be seen, as at B, to the south; at six o'clock in the morning, as at C, to the east, when the naked eye can see them no more until dark again. Nevertheless they pursue their course, for a telescope will show them, as at D, at noon tailing up northward, whilst at six o'clock, when the sun has disappeared, they will be found again at A, having completed their circle. Now, country people, who are well practised in the nightly observation of these stars, are able to subdivide the circle by means of hill-tops, clumps of trees, &c., and thus ascertain the time of the night to within an hour. Indeed, if one had a room-window facing these stars, there would be no difficulty in constructing a card-board circle with slits in it, corresponding to the positions of the pointers at known times, and having intervening slits between the cardinal ones, with the hours painted thereon. By such a simple home-made night-star dial there would be no difficulty whatever, on a clear night, in telling what o'clock it was by merely looking at what particular slit the pointers were visible through. At first sight they seem to move in a contrary direction to the sun, but this is not so in reality; for we have only to consider the diurnal revolution of the earth, and that these stars are to us over the flattened part of it, where the meridians of latitude gradually vanish to the polar point, and we will soon ascertain that the motion, or apparent motion of these stars—for they are considered as "fixed"—is quite in accordance with the daily whirl of the earth. It will thus be seen that the movement of the Plough in the manner, which has here been described may be looked upon as a system of natural horology coeval with the exercise of man's intelligence in that direction, and, we may very fairly assume, was consulted thousands of years ago, countless ages before mechanical horology would be even dreamt of! Nay, as if not to slight the clockmaker's art, there is a constellation in the southern hemisphere which astronomers have named *Horologium* (!).

From the foregoing observations the reader will find no difficulty in coming to the conclusion that the ancient mode of measuring time was principally by the inspection of the position of the sun and stars.

Euripides, the celebrated Greek dramatic poet, who flourished between the years 480 and 407 before Christ, fully confirms this view even in his time. He was the Shakespeare of his age, and wrote, according to the best authorities, about one hundred and eighty tragedies. In one of them the *Chorus*, speaking with reference to the hour of the night, is made to say,—

"What is the star now passing?
The Pleiades show themselves in the east,
The Eagle soars in the summit of heaven."

Before the invention of horological mechanism it may be easily understood that "What is the star now passing?" was an hourly question during the night, and the natural divisions of the day were those chiefly relied upon by people of all ages and conditions. We have very scant knowledge, apart from Caesar's "Commentaries," of what England was even in the days of the Romans, to say nothing of what it was in remoter periods of history. One thing is quite clear, namely, that the general hyperborean nature of our seasons was not favourable to either sun or star time-keeping. But in other parts of the world, both of Europe and the East, the fair, settled conditions of delightful climates enabled the inhabitants to avail themselves to the utmost, not only of astral horology for the night, but of the sun and his shadows during the day. How many ages must have gone by before mankind exercised the genius to lay the sun under hourly report!

We have now said all that we intend in our introductory essay upon this most interesting subject; and, in doing so, we have steadily kept before us the fact that every inquiring horologist should know some of the outlines of the philosophy of an art that may fitly rank among the greatest inventive fruits of the human mind. In our next we shall deal with the dawn of horological mechanism from the earliest ages, and so continue to our own day.

(To be continued.)

THE AMERICAN WATCH COMPANY, of Waltham, Mass., having established a branch in London, is removing to the very eligible premises now in course of completion on Holborn Viaduct, immediately opposite Hatton-garden. Thus, American enterprise comes boldly into the field directly in the centre of the trade neighbourhood. We hear that the results of some tests of these watches, which have been in the hands of competent judges for several weeks, are very satisfactory. We shall endeavour to glean what detail we can of the workings of this company, which stands in such high repute across the Atlantic, and place the particulars thereof before our readers as early as possible.

A TREATISE ON PITCHINGS.

By M. LE FRANÇOIS DE LALANDE, of the Academy Royal Sciences, Paris, &c.

(Translated from the French.)

THE following excellent translation from the original article by the above-named celebrated astronomer, who was born at Bourg in 1732, is given by the Rev. Mr. Nelthorp, M.A., F.S.A.

I. When it is asked what is the most advantageous form which can be given to the tooth of a wheel and the leaf of a pinion, in order that there may be a perfect pitching in strict accordance with geometry; by this expression, perfect pitching, we understand that which fulfils the following conditions:—

1. That the force impressed by the wheel to drive the pinion be the least that can possibly be exerted.
2. That the velocity with which the wheel drives the pinion be likewise at each instant the greatest possible, or that the wheel is able to impart.
3. That both this force and velocity must be always the same from the moment of contact to the instant when the wheel ceases to act, or quits the pinion.
4. That the friction produced by this tooth during the whole period of the driving be the least possible.

II. Persons employed in the art or business have always neglected this accuracy, because they have regarded it as coming under the cognizance of pure geometry; considering either the investigations too difficult to be put in practice, or else not recognizing their great utility. It is desirable to make the ideas of geometricians in this respect better understood, and use every means to efface these prejudices.

III. I hope that the great ease with which the curves necessary to produce a perfect pitching are about to be determined by means of the simple elements of geometry, will inspire artists wishing to distinguish themselves by the perfections of their work with the desire to acquire the little knowledge of geometry which the following principles demand.

IV. If the force with which the wheel drives a pinion be not constant and equal, there will be occasions where the force impressed, will be greater than at other times upon the regulator, or the last wheel, which will sometimes produce a quickening, at others a sluggish motion.

V. If the force be not the least possible, all which is in excess will be pure loss, and only tending to render the friction more severe, increase the wear and the destruction of the machine. In large clocks this excess of unnecessary force may be exceedingly great, so much so, that some have been seen which required a motive-power of not less than 1200 lb. weight, instead of merely a few pounds, which would have been just sufficient to raise the detents and overcome the friction, had the pitching not been defective.

VI. If the velocity with which the pinion is driven be not uniform, the same inconvenience will occur. There will be shocks in the wheel-work, which will prevent the uniformity of movement and increase the destruction of certain parts.

VII. From uniformity of the force proceeds the uniformity of friction, which always changes according as the force is variable.

M. de Roemer (1675) was the first to perceive, in the last century (as well as M. de la Hire (1695), in the ninth volume of the "Memoirs of the Academy," from 1666 to 1699, page 415), the use to which geometry could be applied in this matter. A most excellent treatise on this subject, by M. Camus, may be found in "Memoirs of the Academy of Science" for the year 1733. M. le Roy, of the same Academy, has proved certain propositions of this treatise in a manner easy to be understood, as may be seen in the fourth volume of the "Encyclopædia," by means of levers, just in the same way as M. de la Hire had done (*see* page 411 of the "Ancient Memoirs of the Academy"). I propose endeavouring, if possible, to make these articles more simple in the order and method of demonstrating them, and by adding such necessary details as will bring them within reach of the capacity of all men.

VIII. Thus, instead of commencing with a general but complicated proposition, which would be more elegant and would include the whole matter, I will begin with the most simple case, that of a wheel which will drive a pinion, or a lantern whose staves shall be merely lines infinitely drawn out, and so thin as to be represented by mere points, commencing only on the line of centres

and continuing them beyond. Afterwards, I intend to pass on to more complex examples.

In order to understand the train of reasoning of this treatise, it will be necessary to give attention to certain properties of epicycloids which will be briefly explained.

IX. Suppose a circle, A, (Fig. 1) to roll upon a right line, C D, in the same manner as a wheel upon the road, and that any point whatsoever, E, of this circle be selected, it will be seen that in the movement of the circle the point E, in going from the point C, will describe a curve, C E D, called a *cycloid*; the describing point E will have reached to D at the end of the movement, and the line C D will be equal to the circumference of the circle A.

(To be continued.)

IVORY.

ALTHOUGH ivory is an organic substance, and not a mineral, yet writers on precious stones do not fail to speak of it as an article which has at all times been largely used in works of art, and chiefly in ornaments of every kind.

In art, ivory is divided into green and dry, exactly as in speaking of timber for workmen. Articles in green ivory please the eye most, because they are of a white but slightly greenish tint. Yellow ivory is inferior in value to the white, because it shows the beginning of decomposition: oxygenized muriatic acid and the steam and water of slaked lime nearly restore yellow ivory to its original whiteness. The ivory of the hippopotamus' teeth is very much valued, because it never loses colour. Ornaments of most beautiful design in ivory have been obtained from the ancient tombs, but, on account of their great antiquity, they were nearly decomposed; methods have, however, been discovered by which their original consistency is restored, and which is accomplished by dipping them in a glutinous solution, such as thin gum-arabic water, &c. Burnt ivory, or ivory-black, is usually put at the back of those diamonds which, not being of the purest water, are set in the manner technically called a *notte* (i.e., dark), and in such case helps to give them an admirable lustre.

Fossil ivory has been excavated of different degrees of hardness, but always recognizable by its thread-like tissue. Sometimes it preserves its natural colour; at others it takes various tints, according to the substances amongst which it is found; hence it would be easily mistaken for a turquoise or a fossil gem, if, when cut, the colour were the same as that of the surface.

History tells us that Dipœnus and Scyllis, disciples of Dædalus, excelled in making statues of ivory and ebony. The statues of Diana and Tegea, and also that of Ajax at Salamis, were entirely of ivory. The seats of the kings of Rome, and those of the consuls, were likewise of that material. According to Winckelmann, there were in Greece upwards of one hundred statues in ivory and gold.

Boëthius the Carthaginian, Suidas of Naupactia, Parhasius of Athens, Phidias and Mys, were equally celebrated for this description of statuary work.

There are still in existence many antique works in ivory of the Tyrrhenian, Italo-Grecian, Etruscan, Roman, and Renaissance periods, and all of which give an exact idea of the dominant taste in the various epochs, and are examples of the best style of each.

As an ornament, ivory assimilates more with the complexion than any other material. It is worn extensively in the East, and produces the same contrast as a white veil, throwing out the light of the countenance to excellent effect.

Over twenty thousand pairs of tusks are annually used by the Sheffield manufacturers alone, and in London the largest consumption is for the manufacture of piano-keys, combs, and sundry ornaments.

On a recent visit to the well-known establishment of Messrs. Daltrey & Co. (to whom we are indebted for considerable information), we saw some magnificent specimens of works of art from this material, among others, paper-knives, valued as high as 20 guineas each, and several other ornaments of exquisite design and manufacture very unusually met with, as well as a hollow pyramid cut from a tusk, nearly ten feet in length, and which rare specimen was much admired in the last Exhibition.

The carvings in articles of white wood, as well as those in ivory, and the Dresden paintings, which we found exhibited at their establishment, may be classed as works of art which are not often to be met with.

PRECIOUS STONES.

For the following instructive and interesting articles on Precious Stones and the Diamond, we are indebted to the excellent translation of Mrs. John Brogden, as published by her from the Italian of Augusto Castellani.

GENERAL OBSERVATIONS.

WE are indebted to Theophrastus, philosopher of Lesbos, for the most ancient treatise on precious stones. The mineralogical part of the Natural History by Caius Pliny includes a list of observations, many of which are still useful and acknowledged in the science. But mineralogy has only taken the name and position of a distinct and separate science in modern times.

Bauer, the German (known by the name of Agricola, which he assumed in Italy, where he studied with the learned men who rendered it at that time the home of art and sciences), wrote a work about the middle of the sixteenth century, "*De Naturâ Fossilium*," under which denomination minerals were then comprehended, and he was the first person who distributed them into distinct classes.

In Italy, the works of Andrea Cesalpino, of Camillo Leonardo, of Abramo Portaleone, of Giovan Battista Porta, and of Giovanni Serapione were already known.

Linnaeus, who found the system of Agricola still in existence, wished to adopt a new classification for minerals, and was the first to introduce important observations on crystalline forms.

In 1758, Cronstedt, a Swede, discovered the elementary components of metals, and Werner, the Saxon, in 1774, gave some rules for determining mineral species in an empirical manner, and was able to define their character with great precision.

After him, the celebrated Abate Haüy, having discovered the laws which regulate the symmetry of crystals, shed great light on that science, which he thus founded on a more certain basis.

Chemical discoveries very much assisted the right classification of minerals, introducing in the science a new law, founded on analysis, which helped to confirm or slightly modify that which had been already established as to crystalline forms.

Berzelius, Weiss, Becquerell, Ebelmen, Brewster, Mitscherlich, Brocchi, Spadamedici, Pouzi, and a number of learned men of every other nation contributed to the advancement of the science.

The learned, generally speaking, divide minerals into three classes: the first contains combustible minerals; the second, metals; the third, lithoids or stones. These three classes are subdivided, as we have already remarked, into genera, species, and varieties.

To the first class belongs the genus of carbonates, which is divided into four species, the first of which is carbon, properly so called, and of which one of the varieties is the cubic carbon, otherwise the diamond.

The third class distributes stones into twenty-four different genera, which are subdivided into many more species and varieties. For the sake of brevity we shall refrain from giving the denomination of each of these twenty-four genera, or orders, as they are called by others.

It is sufficient for us to know that amongst these orders are the alumina, the silicates, and the fluorites.

To the alumina belongs the species of corundum, of which the ruby, the sapphire, and, in short, all so-called oriental gems, are varieties. Amongst the silicates is pure silex or quartz, from which is derived the varieties of amethyst, rock crystal, plasma, agate, jaspers, obsidian, and opal; amongst the fluorites is the topaz; amongst the aluminous silicates are the species of garnet, emerald, felspar and porphyry.

Gems are found naturally under two distinct modes of composition. Some have the atoms arranged evidently according to a fixed law, and are called "crystalline gems," crystallized gems, and crystals. Others have very minute particles or molecules simply collected together, without constant regularity of form, and are called amorphous gems, from the Greek α , "without," $\muορφή$, "form;" all the gems that solidify, after having been in a fluid state, belong to this class: when they are found under condensed gelatinous forms, like opals, they are called *porodine*; when they appear to have been condensed by ignition into vitrifications, they are called "jaline," i.e., vitreous crystals; this, in mineralogy, denotes a solid body which presents naturally, and without the assistance of art, a many-sided figure, more or less regular, which varies almost infinitely.

However, it must be remarked that these can be divided into six very distinct groups or systems, as follows:—

1st system	...	...	...	cubic
2nd	"	...	...	square prismatic.
3rd	"	...	...	straight rhomboidal.
4th	"	...	...	oblique rhomboidal.
5th	"	...	...	oblique prismatic.
6th	"	...	...	rhombohedric.

(To be continued.)

DIAMOND.

THE ancients gave the name of $\alphaδδμας$, that is "invincible," Latinized by "adamans," to this gem, because they believed it capable of resisting every chemical agent, without itself experiencing the least alteration.

But this perfect hardness is not the only quality for which the gem is prized. It holds the first rank for other reasons, and in all ages it was most precious, and possessed an excessive value. The diamond is rare, not only because it is in so much request, but also because it is found only in certain countries, almost always mixed with other precious minerals, in a comparatively small quantity, and scarcely ever in a state of complete crystallization. It appears that Nature elaborates it with infinite difficulty, and is, therefore, not lavish of this gift.

The diamond, then, is a mineral substance, crystallized in octahedrons and dodecahedrons, as also in almost all the derivations of these two forms.

Its brightness is so superior to that of every other precious stone, that it is always distinguished as *adamantine*.

Its natural surface is often unequal; its sides are lined, somewhat convex, and generally appear dulled, or, as they are commonly called, *rough*, by the evident action of fire, which Nature uses in forming them.

It breaks regularly into four principal cleavages.

Reduced to powder, it still preserves its prodigious hardness; and though it may appear that this quality might prevent its pulverization, yet it must be remembered that the hardness of a body does not generally prevent its being reduced into minute particles.

This mineral becomes electrical and phosphorescent. It acquires the first property by friction, but only preserves it fifteen or twenty seconds.

Its phosphorescent property is apparent not only in a strong light, but when shaded by glass, paper, or muslin, and even covered by a sheep's skin, and behind a table of linden wood of the thickness of two hundred millimetres. In order to deprive it of phosphorescence, it must be wrapped in black or dark-coloured paper.

The specific gravity of the diamond varies from 3.444 to 3.550, that is:—

ORIENTAL DIAMOND.

Yellow	...	...	...	...	...	3.550
Rose-coloured	...	...	...	...	...	3.531
Blue	...	...	...	...	...	3.525
Green	...	...	...	...	...	3.524
White	...	...	...	...	...	3.521

DIAMOND OF BRAZIL.

Yellow	...	...	...	...	...	3.519
White	...	...	...	...	...	3.444

Placed in the hydrostatic balance, it loses two-fifths of its weight, and this is the sole point of resemblance between it and the white topaz of Brazil, excepting the colour.

The different specific gravity of the various diamonds under the same form is clearly produced by the different degrees of colouring proceeding from the metallic oxides, which are heavier than the crystalline substance which contains them. It seems, however, that those contained in the American diamond are less pure, and therefore lighter.

One of the most beautiful qualities of the diamond is its power of refraction; that of water is 0.785; that of the ruby, 0.739; that of the rock crystal, 0.654; that of the diamond, 1.396.

The refraction of the diamond is single in the entire crystals; when broken, it possesses double, but imperfect refraction, in the thin layers.

The polarization of light gives in the topaz an angle of 31° ; in the Strass, 35° ; in the diamond, 22° .

The purest diamonds, that is, those of the finest quality, are quite

devoid of colour; in other words, when faceted, they reflect all the prismatic colours.

In the mines, however, these were only found in the proportion of one-fifth; those of the second quality, and much less esteemed, are in the proportion of one-fourth, and are covered with a yellowish, greenish or bluish colour; the remainder present the most varied colours. The colouring principles are due to oxides and metallic vapours, which in the formation of the diamond are introduced amongst the molecules.

Coloured diamonds almost always preserve their transparency and limpidity. Some of these, of a fine yellow, have often more light than the colourless stones, but some of these become dark, and even opaque, from the presence of too much colouring material.

The largest diamonds, in a rough state, were called "parangons," and, according to their degree of purity and brightness, were said to be, as at present, of the *first* and *second water*. Small diamonds, partly rough, are called "*grani di sale*." The so-called "old-rock" diamonds are all distinguished by extraordinary light and purity, and are found in both the Old and New World. Pliny states that the hardness of the diamond cannot be equalled, and that it triumphs over fire, so that it cannot be warmed. In more recent times Cronstedt supposed that the diamond, considering its excessive hardness, ought to be regarded as a formation of particular elements, rather than of quartz and corundum.

De Born, Scopoli, Pott, Carthenser, and Wollendorf believed it to be nothing but the purest earth. Bergman was the first who ranked it amongst combustibles. Linnæus said the diamond was different from all other gems. Buffon looked on it as a distillation of igneous material produced from water. Guyton Morveau conjectured the diamond to be a pure water deprived of that principle which, at a certain degree of heat, renders it liquid. Baumé affirms that the diamond is a phlogistic material in a particular condition. Valmont Bomare calls it "the purest rock crystal."

Boëce de Boot, in 1609, suspected that the diamond was an inflammable body. Boyle, in 1673, succeeded in burning it. Newton in 1704, having measured its refracting force, and found it greater in proportion to its density, compared with other gems, placed it immediately amongst combustibles. Averani and Targioni, in the Florentine Academy of Cimento, made some fine experiments on the diamond, tending to prove Newton's opinion.

The celebrated Lavoisier proved the true nature of the diamond, and declared it to be carbon.

In the year 1800 Clowet, Weller, and Hatchette, placing in a crucible 60 parts of iron and 1 of diamond, and holding it to an intense fire, obtained a piece of most perfect steel; which proved that the diamond combines chemically with iron, and therefore that it is a carbon. In progress of time similar experiments were many times repeated, and all demonstrated that the diamond resolves itself in carbonic gas.

Brewster believes it to be composed of vegetable elements. Arago holds it to be hydrogenated carbon; Davy finally has decided that it is an oxygenized carbon. It has never been precisely declared who first discovered the diamond, and by what nation its value was first known and prized.

It is said that the Etruscans, by means of their commerce with the interior of Africa, knew it, and used it ornamentally. Others affirm that it was first discovered in Syria. The Greeks certainly valued it very highly, and attributed to it extraordinary magical virtues. The Romans also used it, but we cannot assert whether they had it traditionally from the Tyrrhenians, and afterwards from the Etruscans, or if it first became known to them by means of trade between Greece and the East.

The ancients, however, only used the diamond in its natural state, without faceting it or subjecting it to any process but that of being polished.

It appears, nevertheless, that before the time of Pliny this gem was very rare in Italy. In the time of the Cæsars it became more common, owing to the more easy communication with the East.

(To be continued.)

A SUBSTITUTE FOR DIAMOND DUST.—Amongst the recent important inventions is one which a Mr. Mackintosh has patented. It will command a large amount of attention, as it converts what is at present a very high cost into a comparatively insignificant one. It is a method of hardening glass to such an extent as to render it an efficient substitute for diamond dust. This important result is obtained by cooling the glass in refrigerating moulds.

NOTES OF NOVELTIES.

FASTENINGS FOR JEWELLERY.—Mr. G. Pendleton, of Birmingham, has recently taken out a patent for fastening jewellery. The invention consists substantially of three component parts. There is first a plate or disc of metal, suited to fit within the solitaire, and having its centre raised in such manner that a recess or grooved space is formed in which the "post"—hereinafter described—may revolve. The second component part is the "post," which is a piece of metal attached vertically to a solitaire back, and which, when in use, takes through the button-hole of the article of dress to which the invention is applied. The third component part is the spring, which is made to fit the inside of the solitaire, and which spring consists substantially of a thin circular piece or disc of flat metal, but having so much of it cut away as to leave two elastic arms, which, when this cut-away disc is placed within the solitaire, may act as springs upon the two rigid arms of the post when they come in contact with them.

BUTTONS, WASHERS, RINGS, LINKS FOR CHAINS, &c.—Mr. J. E. Harrison, of Aston, has obtained patent rights for these articles. His invention consists in arranging the piercing tools, by which the thread-holes for the buttons are pierced in the sheet metal, in front of the shaping and cutting out tools by which the metal around the groups of piercings is shaped, or domed, and cut out. The result of this arrangement is, that at each descent of the compound tool, three (or more) groups of the thread-holes are pierced in the sheet metal, and three (or more) finished buttons are made; the piercings in the sheet metal made by the last descent of the compound tool forming the thread-holes of the buttons made by the next descent of the said compound tool. When the thread-holes of the button are made in a central depression, a shaping tool for making the said depression is placed between each piercing tool and cutting-out tool. This invention is particularly applicable to the manufacture of a single shell sewn through buttons, but may also be applied to the manufacture of washers, rings, links for chains, and other like articles from sheet metal.

MOUNTING FOR HAND MIRRORS.—E. P. H. Vaughan, Chancery-lane, has patented an invention which consists in an improved mounting for hand-mirrors, provided with a tubular handle hinged to the frame, and enclosing a spindle surrounded by a spiral spring. A number of holes or notches are cut in the fixed part of the hinge for the reception of the lower end of the spindle, which, entering therein under the pressure of the spring, locks the handle into any required position.

RECENT APPLICATIONS FOR PATENTS.

1077. By J. CHALLENGER, of Birmingham, for "Improvements in apparatus for illuminating clocks for public and other buildings."

1254. By F. NIBLEH, Hammersmith, for "Improvements in iron safes, bolts or fastenings for the same, part of which improvements are applicable to other purposes."

1324. By F. X. F. HEILBORN, Birmingham, for "A new improved spring earring."

1383. By A. PORTER, of Maidstone, for "Improvements in watch-pockets, and the manner of attaching the same to vests, for protecting watches."

1504. By H. L. PAGE, Soho, for "Improvements in studs for collars, belts, and other articles."

1517. By G. W. DAWSON, Birmingham, for "Improvements or additions to seals and bars for chains, lockets and charms, and watch-keys."

1647. By L. JACOB & J. BROWN, Birmingham, for "Improvements in solitaires, sleeve and other studs and like fastenings, or ornaments."

1852. By R. WHITTAKER, Blackheath, for "Keyless going barrel watches."

MINING IN AMERICA.—From the statistics prepared by the United States Commissioner of Mining Statistics, it appears the progress of the mining industry in the Pacific States and Territories during 1873 was satisfactory. The total production was much larger than in 1872. The estimates of the production of the United States in gold since its discovery in California show the amount in California in 1848 to be \$10,000,000, and in 1873, \$17,000,000. The highest amount was in 1865, \$65,000,000. The entire product from 1848 to 1873, inclusive, was \$986,800,000; other States and Territories \$254,950,000, being a total \$1,240,750,000. Total silver \$186,050,000. Total gold and silver from 1848 to 1873, inclusive, \$1,426,800,000. Gold product before 1848, \$14,400,000. Total gold and silver product of the United States, \$1,441,240,000.

THE SWITZERLAND WATCH FACTORIES.

AS an instance of the dimensions which horological industry has attained in Switzerland, the *Journal de Genève* gives the following statistics:—In the four cantons of Neuchâtel, Berne, Vaud, and Geneva, more than 25,200 men and 12,700 women are employed in the various branches of the business, and of which number 30,600 belong to Neuchâtel and Berne. Of late the trade has grown most rapidly in Berne, where half a million of common watches are manufactured annually, at an average value of 40 francs each. In the canton of Geneva the number does not exceed 150,000 per annum, but nearly all of which are in gold cases, and ornamental, so that their total value is about the same as the half million produced in Berne.

Vaud makes about the same number as Geneva, the movements being generally well finished, but many of which are exported without cases, their average value being considered about 55 francs each. In the same canton about 80,000 musical-boxes of various descriptions are manufactured.

About half the number, and in proportion of 35 per cent. in value, of all the watches manufactured in Switzerland are made in Neuchâtel.

The total number of watches manufactured is given as follows:—

Switzerland	1,600,000
France	300,000
England	200,000
America	200,000

But, beyond the manufacture in Switzerland, these figures cannot be taken as positively reliable.

The approximate value of those produced in the above-named four countries being £4,800,000.

COLOURING METALS.

IT is frequently desirable to alter the natural colour of gold, brass, and other metals, either for the purpose of ornament or to render frequent polishing less necessary. For this end, the following recipes will be found very serviceable:—

TO HEIGHTEN THE COLOUR OF GOLD.

Place 4 oz. of saltpetre, 2 oz. of common salt, and 2 oz. of alum, in a crucible. Add sufficient water to cover the mixed salts. Now place the crucible on the fire and allow the mixture to boil. When this takes place, place the article to be coloured in the mixture, taking care that it is suspended by a hair. It may be left in the crucible for about 15 minutes, when it should be withdrawn, well brushed with a fine scratch-brush, and re-dipped if the colour is not intense enough.

For small gold articles, such as a keeper or plain ring, &c., a very good plan is to place them on a lump of charcoal and make them red-hot under the blow-pipe flame, and then to throw them into a pickle composed of about 35 drops of strong sulphuric acid to the ounce of water, allowing the articles to remain therein until the colour is sufficiently enhanced. Washing the article in warm water, in which a little potash has been dissolved, using a brush, and finally rinsing and drying in boxwood sawdust, completes the operation.

Another colouring mixture, which has been greatly recommended, consists of a mixture of 20 gr. sulphate of copper, 40 gr. French verdigris, 40 gr. sal-ammoniac, and 40 gr. saltpetre, dissolved in 1 oz. of glacial acetic acid. The articles, suspended by a horse-hair, as before, are to be immersed into this mixture, withdrawn and heated on a piece of copper until black. They are then to be placed in a pickle of equal parts oil of vitriol and water, which removes the black coating and brings up the colour. Washing in weak potash-water, rinsing and drying as before, terminates the treatment.

SILVER.

Silver which has become much tarnished may be restored to its primitive beauty by immersion in a warm solution of 1 part cyanide of potassium to 8 of water. (This mixture is extremely poisonous.) Washing well with water, and drying, will produce a somewhat dead-white appearance, which may be quickly changed to a brilliant lustre by polishing with a soft leather and rouge.

FINGER RINGS.

THE WEDDING RING.

From the "New York Jeweller."

THE fyancel or wedding ring is supposed to have originated at Rome, where it was usually given at the betrothal as a pledge of the engagement. Its primitive form was that of a signet or seal ring, and the betrothed and wedding rings of Luther have been safely kept in his native country. The first-named one is of gold elaborately worked with the various symbols of the passion of the crucified Saviour, as the spear, the hyssop, the rod of reeds, the dice, &c., and the whole is surmounted with a ruby, the emblem of exalted love. Inside are the names of the betrothed pair, and the date of the marriage (*Der 13 Junii, 1535*). This ring was presented by Luther to Catherine Boren at the betrothal, and was worn by her then as well as after the marriage. The workmanship is elegant, and it is said that it was designed by the great reformer's friend, Lucas Cranach, but the design was by no means uncommon. A gold ring was found in Coventry Park, near the Town Hall, in the autumn of 1802, by a person who was digging potatoes. On examination it was found that on it the Saviour was represented rising from the sepulchre, with the hammer, ladder, sponge, and other emblems of His passion. Five wounds were shown, and which represented the wells of everlasting life, of mercy, pity, grace, and comfort. This was an amulet, and inside were inscribed the names of the three kings of Cologne. The wounds of Christ were often upon rings, and Sir C. Shaw, alderman and goldsmith, directed by his will (*circa 1487*) that sixteen rings should be made of fine gold, with representations of the wells of pity, mercy, and everlasting life, and which emblems should be given to his friends.

(To be continued.)

ERECTION OF A NEW FACTORY.—We recently had the pleasure of inspecting the extensive and very complete factory for the manufacture of watch movements erected by Mr. James Berry, of Warrington Road, Prescott. The building, which is large and commodious, must doubtless rank among the leading establishments in the trade. It is remarkably well-ventilated, and every consideration seems to have been entertained in order to promote the comfort and health of those employed therein. The engine-room, boiler-house, &c., being fitted up by the well-known firm of Wyatt & Roberts, of Coventry, is sufficient guarantee of its having been done in the best possible manner, and while no efforts have been wanting to render the factory complete in every detail, Mr. Berry has certainly succeeded in such attempt, and the trade will, doubtless, be well pleased with a visit to the establishment.

THE NICKEL-SILVER PLATING COMPANY.—A special meeting of the shareholders of this company was held during last month, at the Cutlers' Hall, Sheffield, for the purpose of taking into consideration the position of the company, and that of the vendor and managing director, Mr. John Unwin. The company was started less than two years ago. The shares were 2000, at 10*l.* each. The vendor received 5000*l.* in cash and 200 fully paid-up shares. He guaranteed a dividend of 15 per cent. for a certain number of years. This dividend has not been forthcoming, and it was stated that the vendor was not in a position to pay it. One portion of the works was unremunerative. The directors submitted a resolution that the vendor should be liberated from his guarantee on condition that he surrendered the whole of his fully paid-up shares and his rights in certain new patents, and that part of the works should be sold. This resolution met with a good deal of opposition on the part of the shareholders, who were anxious that the vendor should be kept to his guarantee; but on the directors stating that it was impossible to obtain the guarantee the resolution was allowed to pass.

ALLEGED false trading in the jewellery trade led to a recent meeting in Birmingham for the purpose of taking steps to prevent a continuance of the evil. The ground of complaint is that persons represent themselves to jewellers as being general dealers with extensive business connections, and obtain jewellery in a decidedly "wholesale" manner, leaving their victims to discover that they are occupants of lodgings rented at 4*s.* or 5*s.* a week, "poor as rats," as one speaker described them, and turning out to be fraudulent bankrupts instead of honest tradesmen. A trade organization is looked upon as the only safeguard against such fraud, and the meeting resolved to form a "mutual protection society." The details upon which the society will be set into operation have not yet been decided upon.

NOVEL AND IMPORTANT IMPROVEMENTS IN RECORDING THERMOMETERS.

A NEW and valuable meteorological instrument has recently been produced by Messrs. Negretti & Zambra, which will not only set at rest the controversy and discussion concerning priority of invention of protected bulbs for deep-sea thermometers, but will also supply an important want, and prove of considerable interest to scientific persons, and to meteorologists in particular.

For general information, it should be stated that, until recently, the only thermometer available for the purpose of registering temperature and bringing those indications to the surface, was that commonly known as the Six's thermometer—an instrument acting by means of alcohol and mercury, and having movable indices with delicate springs of human hair tied to them. This form of instrument registers both maximum and minimum temperatures, and as an ordinary out-door thermometer is very useful; but it is unsatisfactory for scientific purposes, and for the object for which it is now used (*viz.*, the determination of deep-sea temperatures) it leaves much to be desired. Thus the alcohol and mercury are liable to get mixed in travelling, or even by merely holding the instrument in a horizontal position; the indices also may slip if too free, or stick if too tight. A sudden jerk or concussion would cause the instrument to give erroneous readings by lowering the indices if the blow be downwards, or by raising them if the blow be upwards. It was for this reason that it became a matter of serious consideration with Messrs. Negretti & Zambra, whether a thermometer could be constructed which could not possibly be put out of order in travelling, or by incautious handling, and which should be above suspicion and perfectly trustworthy in its indications. This was no very easy task. But the instrument submitted by them to the Fellows of the Royal Society, and which is represented in the accompanying drawing, seems to fulfil the above onerous conditions, being constructed on a plan different from that of any other self-registering thermometer, and containing nothing but mercury—neither alcohol, air, or indices. Its construction is most novel, and may be said to overthrow all previous ideas of handling delicate instruments, inasmuch as its indications are only given by upsetting the instrument. Having said this much, it will not be very difficult for our readers to imagine the action of the thermometer; since it is by upsetting or throwing out the mercury from the indicating column into a reservoir, at a particular moment and in a particular spot, that we obtain a correct reading of the temperature at that moment and in that spot.

The thermometer in shape is like a syphon with parallel legs, all in one piece, and having a continuous communication, as in the annexed figure. The scale is pivoted on a centre, and being attached in a perpendicular position to a simple apparatus (which will be presently described), is lowered to any depth that may be desired. In its descent the thermometer acts as an ordinary instrument, the mercury rising or falling according to the temperature of the stratum through which it passes; but so soon as the descent ceases, and a reverse motion is given to the line, so as to pull the thermometer to the surface, the instrument turns once on its centre, first bulb uppermost, and afterwards bulb downwards. This causes the mercury, which was in the left-hand column, first to pass into the dilated syphon bend at the top, and thence into the right-hand tube, where it remains, indicating on a graduated scale the exact temperature at the time it was turned over.

The woodcut (Fig. 1) shows the position of the mercury after the instrument has been thus turned on its centre. A is the bulb; B the outer coating or protecting cylinder; C is the space of rarefied air, which is reduced if the outer casing be compressed; D is a small glass plug on the principle of Negretti & Zambra's Patent Maximum Thermometer, which cuts off, in the moment of turning,

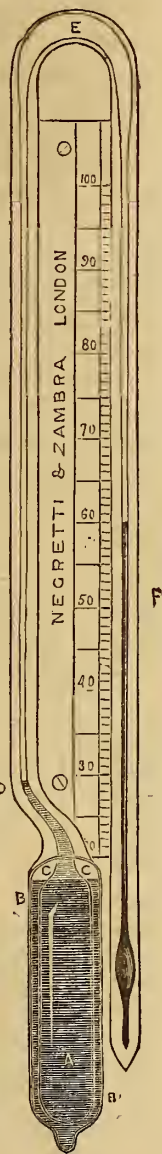


Fig. 1.

the mercury in the column from that of the bulb in the tube, thereby ensuring that none but the mercury in the tube can be transferred into the indicating column; E is an enlargement made in the bend so as to enable the mercury to pass quickly from one tube to another in revolving; and F is the indicating tube, or thermometer proper. In its action, as soon as the thermometer is put in motion, and immediately the tube has acquired a slightly oblique position, the mercury breaks off at the point D, runs into the curved and enlarged portion E, and eventually falls into the tube F, when this tube resumes its original perpendicular position.

The contrivance for turning the thermometer over at the bottom of the sea may be described as a vertical propeller to which it is pivoted. So long as the instrument is descending, the propeller is lifted out of gear and revolves free, but as soon as the ascent commences the action is reversed, the propeller falls into gear with a pinion connected with the thermometer, and by these means the thermometer is turned over, and after one turn it remains locked and immovable.

The engraving, Fig. 2, shows the general arrangement; T being the thermometer; S a metal screw connected with the frame of the thermometer by a wheel and pinion movement at W; S+ is the stop for arresting the movement of the thermometer when it has made one revolution.

Besides being available for deep-sea temperatures this instrument must prove of great value on land, since it may be carried in any position, and cannot possibly be put out of order except by actual breakage; and therefore we are at once provided with the means of making observations which will solve some of the most interesting questions connected with atmospheric temperature. Hitherto we have been without any instrument which would automatically record *out of doors* the exact temperature at fixed periods; we read of the temperature being so many degrees of heat or cold yesterday or last night, but we have no means of recording how cold it was (say) at midnight, or how warm at midday, except by actually watching the instrument at those hours. With the aid of this new thermometer in connection with an inexpensive time-piece, we can ascertain and record the exact temperature at any hour it may be deemed desirable, and by its means, and with experiments carried over some period of time, we may be able to determine, with a degree of accuracy hitherto only approximately arrived at, which are the coldest or warmest periods of the days or nights.

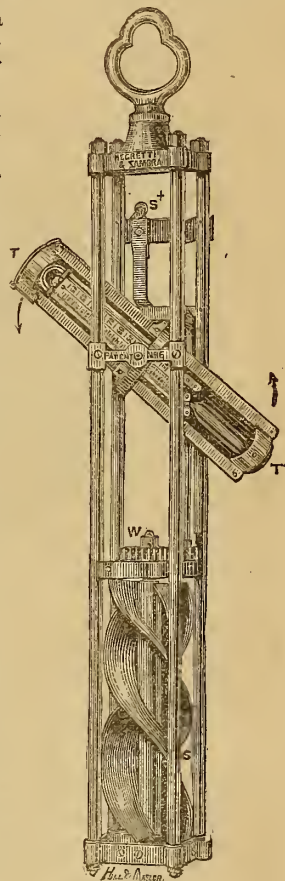


Fig. 2.

IMPORTANT TO GIVERS OF PRIZE CUPS.—By a decision of Mr. Martineau, in the Wolverhampton County Court, it is made imperative that the Committees of Agricultural Societies must not give plated cups as "silver cups." A silver cup must be made of that metal, and not of baser material, either electrotyped or plated. His Honour, in giving his opinion, awarded to a successful exhibitor at a dog-show the full value of a silver cup, for which he had sued, in place of a plated cup, which had been forwarded to him by the secretary of the show. This decision will also affect prizes awarded at races.—*British Mail*.

NEW MICROSCOPIC TELESCOPE.—Mr. C. B. Boyle recently exhibited before the photographic section of the American Institute in New York, a new optical instrument, which he called the microscopic telescope. It consisted of two parallel telescopes, about three feet in length and two inches in aperture, connected with hinges at the ends, and separated to the distance of the eyes by an adjusting screw. In order to produce the effect of the microscope, he places before the object-glass prismatic lenses of about 3 feet focus, so that when these lenses are in position an object 3 feet in front of the object-glass will be seen with both eyes distinctly, and magnified according to the power of the eye-piece.

THE INVENTION OF TELESCOPES.

THE telescope has justly been considered a grand instrument; and it certainly is not a little surprising that man's power should have enabled him to construct an instrument by which objects too remote for the unassisted eye to distinguish should be brought within the range of vision, as if they were only a few yards from our eye, and that thousands of august objects in the heavens, which had been concealed from mortal view for numerous ages, should be brought within the limits of our contemplation, and be as distinctly perceived as though we had been transported millions of miles through the celestial regions from the space we occupy.

The celebrated Huygens remarks that, in his opinion, "the wit and industry of man has not produced anything so noble and so worthy of his faculties as the knowledge of the telescope;" inasmuch as if any particular person had been so diligent and sagacious as to invent this instrument from the principles of nature and geometry, his abilities would have been more than human; but the case is far different, as the most learned men have not been able to sufficiently explain the reason of the effects of this casual invention. Who was the first to construct telescopes, and the exact period when they were first invented, remains still in some degree of obscurity; and whilst it certainly does not appear that such instruments were known to the ancients, we cannot be perfectly decisive on this point. The cabinets of the curious contain some very ancient gems of admirable workmanship, the figures of which are so small that they appear beautiful through a magnifying-glass, but altogether confused and indistinct to the naked eye; and therefore it may be asked, if they cannot be viewed, how could they have been wrought without the assistance of glasses? And as the ancients have declared that the moon has a form like that of the Earth, and has plains, hills, and valleys in it, how could they have known that the *Milky Way* is formed by the combined rays of an infinite number of stars? For Ovid states, in reference to this zone, that "its groundwork is of stars." Nevertheless, whatever knowledge the ancients may have had of the telescope or other optical glasses, it is quite evident that they did not possess telescopes of the power and magnitude which we have.

Among the moderns, the illustrious Friar Bacon appears to have acquired some rude ideas respecting the construction of the telescope. "Lenses and specula," says he, "may be so figured that one object can be multiplied into many, that those which are situated at a great distance may be made to appear very near, that those which are small may be made to appear very large, and those which are obscure very plain." From these expressions it appears highly probable that this philosopher was somewhat acquainted with the general principle both of telescopes and microscopes, and that he may have constructed telescopes of small magnifying power for his own observation or amusement, although he never brought them into general use. He was a man of extensive learning, and made such rapid progress in the sciences, when attending the University at Paris, that he was esteemed the glory of that seat of learning.

The next person supposed to have acquired a knowledge of telescopes was Joannes Baptista Porta, of Naples, who flourished in the sixteenth century. He discovered the *camera obscura*, the knowledge of which may perhaps have led to the invention of the telescope; although it is not known that he ever constructed such an instrument. Des Cartes considers James Metius as the first maker of a telescope, and says that "as he was amusing himself by making mirrors and burning-glasses, he casually thought of looking through two of his lenses at the same time, and found that when so doing distant objects appeared very large and distinct." Others assert that this great discovery was first made by John Lippersheim, a spectacle maker at Middleburg, or, rather, by his children, who were diverting themselves with looking through two glasses at a time and placing them at different distances from each other. But Borellus, who wrote a work on the invention of the telescope, says that Zacharias Jansen (who was likewise a spectacle maker in the same town) made the first telescope in 1590. Jansen was a diligent inquirer into nature, and, being engaged in such pursuits, was trying what use could be made of lenses for these purposes, when he fortunately hit upon the construction; and having found the arrangement of glasses which produced the effect desired, he enclosed them in a tube, and hastened with his instrument to Prince Maurice, who, thinking that it might be of use to him in his wars, desired the inventor to keep it a secret. But the telescope was soon destined

to more noble and honourable achievements. Jansen is said to have directed his instrument towards celestial objects and made many important discoveries, though not aware of their importance at the time of his observations.

(To be continued.)

ROYAL PRESENTS.

ON the opposite page will be found sketches of two very beautiful gold watches, forming part of five similar instruments manufactured, to the order of the King of Siam, by Messrs. Barraud & Lund, of 41, Cornhill, London; as will be seen by the inscription, quoted below, they are presents, and handsome ones too, from the King of Siam to five of his "worthy counsellors and friends," the name of one of them, Phon, Phya Blasha Karawongse, is already well known as the writer of the letter in which His Majesty offered an almost unlimited hospitality to any English *savant* wishing to take advantage of the position of that country for viewing the total eclipse of the sun which has taken place, and he and other faithful counsellors like him are evidently receiving tangible proofs of their august master's appreciation of their services.

Each present consists of a very handsome gold watch, Albert chain, and locket, enclosed in an elegant casket of coromandel wood. The watches are keyless half chronometers, in "sight" hunting-cases, handsomely engraved; the movements are 18° size, with double-roller escapements, chronometer balances, and Brequet springs, winding and setting with or without a key. The keyless work is the "reliable" action, a speciality of the firm, for the purpose of combining simplicity with security. The engraving on the cases is light and elegant, and on a large plain medallion on the back are the royal arms and monogram in blue enamel; on the inner dome is an inscription as follows:—

1874.

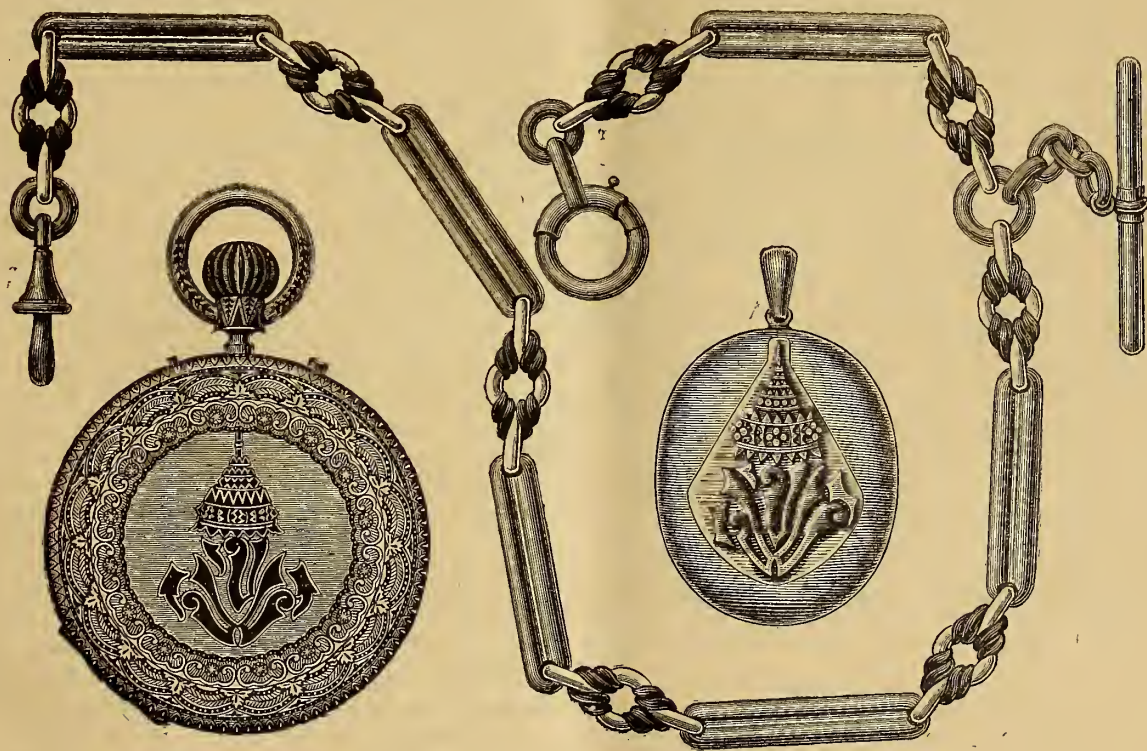
His Majesty,

PHRA BAT SONDET PHRA PARAMINDR
MAHA CHULALONKORN
PHRA CHULA CHOM KLAO CHAO YU HUA
KING OF SIAM,

Presented this token of esteem to His
most worthy Counsellor and Friend,
PHON, PHYA BLASHA KARAWONGSE,
Councillor of State.

The only distinction being the five different names of those honoured with the present. The chains are very heavy, weighing, with the locket, about 5 ounces each. The patterns are quaint, for each chain has been composed of alternate links, or knots of 18 carat gold, silver, and NAK, being a combination supposed to have great efficacy as a charm; this NAK is also a high standard of gold, but alloyed with copper to give it a deep red colour. The lockets are composed of a like combination. The locket proper is of 18 carat gold, on one corner of which is a plate of dead silver, on which again is raised the royal arms and monogram in NAK.

By special efforts they were finished and packed off in time to reach their destination and be presented as New Year's presents (Siamese calendar), and only a few had an opportunity of inspecting them before they were sent away, which is to be regretted, as, perhaps, a more valuable and elegant suite of presents are seldom seen, and the most unqualified admiration was expressed by all who were fortunate enough to see them.



SHOP FITTINGS AND FIXTURES.

"FINE feathers make fine birds," and many articles which are of themselves both elegant and attractive may be improved in appearance by a judicious arrangement, and by being placed in caskets or cases which will do justice to the articles therein displayed. We are led to these remarks by a recent visit to the extensive establishment of Mr. Frederick Sage, of Gray's-inn-road, London, which stands in such high repute for excellence in every description of office, shop, and show-room fittings and fixtures, counters, glass cases, mirrors, fancy stands, &c.

Having been shown through the different departments of this manufactory, we must confess we were quite astonished at its extent, as well as with the numerous appliances and improvements in machinery which we had an opportunity of inspecting. In the sample-room we saw some very handsome patterns of air-tight mahogany fittings and specimens of mouldings. Passing into the show-room, we found a well-assorted stock of air-tight counter-cases, new styles and shapes of counters, centre-cases, jewellers' velvet stands of exquisite manufacture, jewellers' tickets, and every description of glass shades, all of which articles are fully and minutely described in the detailed and explicit catalogue issued by this house. From the last-mentioned department we were conducted through the joiner's shops, the brass-finishing department, the polishing-room, glass-cutting shops, and a host of other rooms and departments; and as space does not permit of our entering into anything like a full description, we must content ourselves by mere enumeration and a few passing remarks thereon. Suffice it, however, for us to state that the glass-cutting shop, the joinery department, and the brass-finishing shop, are in particular supplied with appliances and machinery which would greatly surprise those who have not had an opportunity of inspecting them. Large plates of glass are rapidly cut up by machinery with an exactitude and precision which is really astonishing.

Machines driven by steam-power are provided for all kinds of brass-finishing and the manufacture of brackets, and metal articles used for jewellers' shops and windows; and here we may mention that Mr. Sage is the inventor of a most useful machine specially designed for filing all kinds of metals, which performs the work in less than one-twentieth part of the time that would be required by a man to do it with files. One great speciality of Mr. Sage's business is the manufacture of air-tight show cases, and the great perfection to which he has carried this branch is doubtless due to the enterprise displayed by him in providing the best machinery, totally regardless of cost or trouble. Another prominent feature with this house is, that it was the first to introduce quilted satin linings for counter-cases, trays, &c. These articles, manufactured in a rich blue colour, and applied to fine ebony or black wood, relieved by lines and figures in gold, have a most beautiful and pleasing effect. Among the other manufactures of the firm are oval shades and stands, with velvet-covered trays for earrings, locket, thimbles, and jewellery of every description. In shape they are adapted for different classes of jewellery, great care being taken to give a clear view of each article, and not to crowd together as in the old-fashioned forms. Where several articles are shown on one stand, the surface is so shaped as to show each of them to the best advantage, and permit of the removal of one without the displacement of the rest. Many of these designs are of the most ingenious character, nearly all of which are registered to prevent unauthorized imitation.

In conclusion, we may state that Mr. Sage's establishment is the only one to which an award was made at the Vienna Exhibition for articles of his manufacture. Visitors to the South Kensington Museum and the Alexandra Palace may see in either place specimens of cases manufactured by this firm, whilst for further information they cannot do better than visit the manufactory, where they will find hundreds of elegant and clever designs for shop fittings and fixtures, which our space does not permit us to recapitulate, but which are all of a very attractive and tasteful character.

A CONCESSION important to commerce has been granted by Russia. Goods sent from Prussia to Austria on Russian railways, *via* Brest and Kiev, are not to be subject to visitation at the custom-house, or to duty of any kind. The shortest way from East Prussia to Southern Galicia crosses the Russian railways.

NOVELTIES IN DIAMOND WORK.

VERY few branches of art have advanced with more rapidity during the past ten or fifteen years than that of diamond working. And one of the leading recent novelties in that line is the new design of necklace, pendant, and earrings represented on the opposite page, and manufactured by Messrs. Williams & Son, of Hatton-garden, to whose courtesy we are indebted for the illustration.

Although it is not possible to present a perfect description thereof by the pen, and even the engraver finds it difficult to properly realize the effect to the reader, we cannot pass over the ingenuity, beauty, and attractiveness thereof without furnishing a few details concerning the articles alluded to.

The centre ornaments represented consist of pendant and earrings, styled the classic-harp pattern, formed of the very best selected brilliants and fine oriental pearls, so as to render the effect in wear both pleasing and novel.

The necklace—the chain of which is shown running round the pendant and earrings (and which is represented in reduced size)—is of exquisite design, and one of the most beautiful ornaments which we have seen, and cannot be better explained than by directing attention to the accompanying drawing, and stating that the centre flower is so made that it may easily be removed and made to form a separate ornament either for the neck or the hair.

The entire set is well worthy of inspection, which will fully repay those who may visit the establishment for that purpose.

THE PHILADELPHIA EXHIBITION.

THE salient points of the general regulations affecting foreign exhibitors at the Philadelphia Exhibition of 1876, and the special regulations governing the free importations of exhibits, as determined by the Centennial Commission, are, so far as at present decided, as follows:—

The Exhibition will open at Philadelphia on May 10, and close on November 10, 1876.

Before December 1, 1875, the Executive must send in plans in detail showing individual allotments; with all catalogue information.

No charge for space.

No charge made for a limited quantity of steam and water power. The quantity to be arranged at time of the allotment of space, and any excess of power to be applied for at same time, and to be furnished by the Centennial Commission at a fixed rate.

Goods for exhibition to be considered as bonded and exempt from customs duties.

The usual noxious and explosive substances are prohibited.

Exhibitors or their agents are responsible for the packing, forwarding, receiving, and unpacking of their goods, at both the opening and the close of the Exhibition. The owner, agent, or consignee must be present to receive goods.

Reception of exhibits will commence on January 1, 1876, and no article will be admitted after March 31, 1876.

The installation of heavy objects requiring special foundations or adjustment should, by special arrangement, begin as soon as progress of works will permit.

Space assigned and not occupied on April 1, 1876, will revert to the director-general for re-assignment.

All goods must, under penalties, be removed before December 31, 1876.

The objects exhibited will be protected against piracy of inventions or designs. Sketches, drawings, photographs, or other reproductions of articles exhibited will only be allowed upon the joint assent of the exhibitor and director-general.

The Centennial Commission will take precautions for the safe preservation of all objects in the Exhibition, but will not be liable. Facilities will be arranged by which exhibitors may favourably insure their goods.

Special regulations will be issued concerning the exhibition of fine arts, the organization of international juries, awards of prizes, and sales of special articles within the buildings, and other points not touched on in these preliminary instructions.



THE

Watchmaker, Jeweller, and Silversmith,

A MONTHLY TRADE JOURNAL,

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades,

PUBLISHED AT 8, CROSS-STREET, HATTON-GARDEN, E.C.

Subscription, 5s. per Year, payable in advance; commencing from any date. Single Copies, 6d. each.

Advertisements, Remittances, Subscriptions, Orders for Copies, and all Communications to be addressed to the Publisher of the WATCHMAKER, JEWELLER, AND SILVERSMITH, as above.

Cheques and Post-office Orders to be made payable to A. VICTOR, at Hatton-garden Post Office.

No one is authorized to collect money without production of Printed Form of Receipt, bearing the Office Stamp.

TO ADVERTISERS.

THE pages of the WATCHMAKER, JEWELLER, AND SILVERSMITH present a wide field of operations, as those represented therein may bring their announcements before the immediate attention of all trades to which they are specially addressed, as well as purchasers throughout the United Kingdom, America, the Colonies, and all foreign markets.

All advertisements and correspondence should be forwarded as early as possible in each month.

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The services of an energetic and reliable person are required for the advertising department of this journal. Applications to be made by letter only, to the Publisher, 8, Cross Street, Hatton Garden, E.C.

The attention of our readers, and the trade generally, is called to the form of subscription order, which will be found on page 19. When two or more copies are forwarded to one address, or in instances of subscription clubs being formed so that the copies for such club are sent to one person, a discount of 10 per cent. will be allowed from the regular subscription rates, but in no instance will such deduction be made for subscriptions of less than one year.

PROSPECTUS.

IN the present days of commercial activity no branch of industry can be without its leading representative journal, and experience shows that the time has now arrived when the various trades, to the interest of which our labours will be directed, require a medium equal to others representing different commercial pursuits, and, with the view of possessing which, they should secure to themselves a properly recognized organ wholly devoted to their own peculiar interests.

With the object of supplying this great desideratum, we have determined to issue a new and independent monthly publication, bearing the title of the—

WATCHMAKER, JEWELLER, AND SILVERSMITH'S
TRADE JOURNAL,

of which this is the first number. As such undertaking must necessarily entail considerable anxiety and labour to establish it on a firm basis, so as to become of real benefit to the trades it will represent, we respectfully solicit the kind co-operation and support of every one whom it may concern, whilst the following outline will give a fair idea of its aim and general usefulness. Each number will contain leading articles, penned by men of practical experience, upon subjects of particular interest to Watch and Clock Makers, Jewellers, Gold and Silversmiths, Electro-platers, Opticians, Assayers, and all the other allied branches of these important trades; also, illustrated articles upon the Novelties, Patents, and noteworthy Specialities, both British and Foreign, a brief Monthly Record of Passing Events, Trade Changes, interesting items of Gossip, important Legal and Arbitration Proceedings, the result of Public and other Sales, original contributions upon Art, Applied Science, the Labour Question, Letters from our Own Correspondents in the Provinces, Foreign and Colonial Notes, Practical Hints, Notes and Queries, and a variety of other useful and interesting subjects.

From this brief sketch it will be seen that such a journal can hardly fail to prove of considerable benefit to its supporters, as it will present an opportunity for free interchange of ideas and suggestions on questions affecting the interests of the trades, and at the same time keep its readers fully and regularly posted as to what is going on, besides affording manufacturers and wholesale houses valuable assistance in their business transactions with exporters, agents, and the retail trades.

In concluding these remarks, we especially wish to point out to manufacturers and wholesale houses the great advantage of inserting their trade announcements in the advertising columns of such a journal, and we respectfully direct their attention to the enclosed order-forms, in the hope that they will communicate their wishes as early as possible to the publisher, who will be pleased to afford them every information, as well as offer them the benefit of his experience and assistance in drawing up or arranging their notices.

Continuing our untiring endeavours to please, we shall at all times deem it a favour if our readers or friends will forward us any suitable contributions likely to prove of general interest, or make suggestions, which will be received with thanks and due attention.

All communications to be addressed—

Proprietors of the

WATCHMAKER, JEWELLER, AND SILVERSMITH,

8, Cross Street, Hatton Garden, E.C.

ARTIFICIAL LIGHT.

THERE is, perhaps, no occupation in which the amount and quality of artificial light is more important than it is in that of a watchmaker and jeweller, who is dealing continually with objects of small size, which require to be adjusted in their proper positions with the greatest possible exactitude. As a rule, notwithstanding this, the members of the trade are not as careful as they should be in the matter; and it is only exceptionally, if at all, that they use any of the special contrivances by which common modes of illumination may be improved. Engravers habitually employ a globular glass vessel, filled with water, which acts as a condenser to concentrate light where it is wanted, and to withdraw it from surrounding parts. In this water it is usual to dissolve a little sulphate of copper, or blue vitriol, which serves to neutralize the excessive yellowness of common gas-light, and to render it much less irritating to the eyes. In other trades, the globe of water is used only to concentrate light upon the work which is under observation, and so to make up for what would otherwise be deficiency. The frame-work knitters of the midland counties, for example, who weave stockings, and generally what is called "hosiery," upon frames in their own cottages, and who often live in villages where no gas is to be procured, always use the water-globe to supplement the faint light of a single tallow candle; or, more properly speaking, to guide a large portion of this light to the fabric on which they are employed, instead of suffering it to be lost in other parts of the room. The effect of the globe differs with its position in reference to the flame. If the two are very near together, the light which passes through the globe will spread out a little, like that from a policeman's lantern; but, if the globe and the flame are farther apart, the beam will be brought into smaller compass, as if by a burning-glass, and may all be condensed upon a single point. An afternoon walk through the streets of any large town, however, will show us watchmakers working at a bench by the aid of naked batwing gas-burners, seldom of the best construction, and placed one for each man in such a manner that most of their light is wasted, while all of them together give out an unpleasant amount of heat, and consume and vitiate the air which the occupants of the room are breathing, besides casting cross-shadows in all directions. If employers and workmen would only give to this question a small portion of the thought which its importance demands, it would be easy for them to make arrangements which would be conducive at once to comfort and economy.

All artificial light is the result of a chemical combination between the oxygen of the air and the hydrogen and carbon of the substance which is burnt to afford illumination. This substance is always a gas; because, even if, like oil, it is liquid at common temperatures, it is vaporized in the wick before being burnt by the heat of the flame to which it is drawn up. Chemical union must be a union of definite qualities. So much oxygen unites with so much hydrogen to form water, and with so much carbon to form carbonic acid, and cannot unite with more or less than the proper amount. If, therefore, the due proportions are not observed, there is something over which is always wasted, and often noxious. This may be seen most easily by stopping with a finger the opening underneath the common circular gas-burner, which is known as an argand burner. By this a large portion of the air is shut out, and the carbon of the gas no longer finds oxygen enough for its requirements. Hence, it is no longer burnt, that is to say, it no longer unites chemically with oxygen, but a large portion of it is driven off in the form of a thick black smoke, which renders the air suffocating and unpleasant, while the flame becomes red and dull. On the other hand, if there is too much air for the gas, the flame is unduly cooled, and the quality of the combustion is reduced in consequence. For perfect combustion it is necessary that the air and the gas should come together exactly

in the right proportions; and then, and only then, is there no waste of the combustible material, whatever it may be. It is all burnt, all used in light-giving, and the brightness and colour of the light which it affords are the best that can be attained. On the other hand, if the proportions are not right the combustion is imperfect, which means that the same thing takes place which is seen in the above-mentioned experiment with the argand burner, although probably not to the same extent. The products of perfect combustion are carbonic acid and water, and nothing else, and these are comparatively harmless to living beings. When the combustion is imperfect only part of the carbon is converted into carbonic acid. Another part is driven off as smoke, that is to say, as a finely-divided black powder, which falls as dirt upon everything in the room, and which it is very uncomfortable to breathe. Another part is not converted into carbonic acid, but into a different compound, which is called by chemists carbonic oxide, and which, even in small quantity, is highly deleterious. The colour of the imperfect flame is defective, being tinged with red or yellow instead of being white, and its illuminating properties are very inferior; so that, when the due proportions between the air and the combustible are not observed the consumer suffers in every way. He does not obtain the light which he pays for; and part of his combustible substance is worse than wasted, for it is rendered injurious alike to health and to property. In the case of an oil-lamp, it seems comparatively easy to get the right proportions; but in the case of coal-gas the original difficulty of doing so is greatly enhanced by the varying pressures at which it is delivered, so that much more is forced through the burners at some periods than at others.

During the last three or four years, great advances have been made towards the attainment of perfect combustion for illuminating purposes; and these have been mainly due to the labours of Mr. Silber, the founder of the Silber Light Company. Mr. Silber first turned his attention to oil-lamps; and, after prolonged and costly experiments, he succeeded in making burners, both for colza oil and for petroleum, which not only maintained the right proportion between the supply of air and the supply of fuel, but which also delivered a portion of the air into a part of the flame which had not previously received any. His lamps were, in simple language, oil furnaces which consumed all their own smoke, and which yielded flames of a size, brilliancy, and whiteness which had never before been approached. Perhaps the best test of the quality of their light is that it displays all colours correctly, as sunlight would do, so that it would enable the operation of "matching colours," so justly dear to the female heart, to be accomplished accurately in the evening. The drawback to these lamps was that they consumed a great deal of oil, not light for light, but absolutely, so that they were more costly in use than was needed for some requirements. A person who burnt one moderator lamp, which gave a light equal to that of twelve candles, and who found this light sufficient for his purposes, might obtain a light equal to that of twenty-six candles from a Silber lamp of the same size, which would burn half as much more oil as the old one. If he did not want the light, the new lamp would be extravagant. But the person who burnt two moderator lamps could replace them both by one Silber, getting more light from it than from its two predecessors together, and saving one quarter of the oil which he formerly consumed. When the lamps were perfected, Mr. Silber next turned his attention to gas; and, having already worked out the principles on which complete combustion depends, he succeeded in applying these principles to gas-burners also, both argand and batwing, and in such a way as to obtain either a much-increased illumination for the same consumption, or the same illumination for a diminished consumption, according to the wants of the consumer. To the argand burners, moreover, he attached an ingenious governor, by which compensation can be made for the variations of pressure upon the supply.

The effect of all these inventions is, that the whole of the oil or gas employed is turned to good purpose, and is manufactured, so to speak, into light of the best and purest quality. Nothing is dispersed wastefully in the air of the apartment; and nothing is dissipated in the form of noxious and imperfectly-oxidized compounds. Whatever kind of fuel may be used, the purchaser obtains full value for his money.

For the purposes in which our readers are most interested, it is necessary to inquire not only how the best light may be procured, but also how it may be best disposed to meet the requirements of the workman. In all labour there are frequently-recurring moments of repose; and in all fine varieties of labour, such as are calculated to tax the sight, it is desirable that these intervals should afford rest to the eyes. Brilliant light stimulates and fatigues the eyes, comparative darkness relaxes and refreshes them. The writer of this article was told by an eminent oculist always to read or write in the evening by a shaded lamp, and also that the shade should itself be opaque, or nearly so, and lined with a white, reflecting surface. Thus arranged, it throws an abundance of light upon the page or the table; but yet the eyes, whenever they are raised from their occupation, are raised to obscurity. Of the advice thus given him, he has found the value by experience, and acts upon it constantly. Now, the great brilliancy of the Silber-argand burners, whether for oil or for gas, allows their flame to be covered by an opal globe, which does not permit the flame itself to shine through it as a bright central spot, but diffuses from its whole surface a perfectly uniform, soft, white illumination, a sort of artificial daylight, in all directions. Such a globe, even if there is no other protection for the eyes, is much less stimulating to them than any naked flame, or than any flame which is covered by ground-glass only. But to such a globe it is perfectly easy to add a cover which shall shade its upper portion and cast nearly all its light upon the bench, and the height of this cover might be easily arranged so as to suit the habitual level of the hands of the workmen. On a small bench, moreover, say, where four men are employed, and where four common batswings are now burning dingily and wastefully, it would be easy to replace them by a single Silber-argand, placed centrally and fitted with an opal globe. The effect would be like that of diffused daylight, the saving of gas would be very considerable, and its cost, as well as the vitiation of the atmosphere, would be spared. There would be no cross-shadows from the different burners; and, if more light were required for any purpose, it would be easy to fix before each workman a common bull's-eye, supported by a jointed stem so that it could be set at any desired height or angle. Such a bull's-eye would furnish a concentrated beam, in which the work could be held at any time when a particularly strong illumination was required; and the beam, while it would light up the work, would not fall directly into the eyes of the workman. In every calling it is necessary, or at least desirable, to seize hold of and utilize all the aids which can be obtained from extraneous sources, or from the researches of men who are engaged in other pursuits; and the researches of Mr. Silber, whilst they will be of advantage to all, except those—if such there are—who get up at sunrise and go to bed at sunset, promise to be especially useful to those who are engaged in fine handicrafts. We counsel our readers to consider whether the lights which they now employ are such as to fulfil all their requirements; and, if they are not, to make trial of "Silber burners" without delay.

THE principle of correct time-keeping qualities of a watch or clock may be compared to an exact circle with a pivot or centre exactly equi-distant from any point of the circumference. The truer the circle (as well in distance as in height) the more exact the performance.—*New York Watchmaker and Jeweller.*

MESSRS. LAWSON & GODDARD, of No. 5, Hatton-garden, have on view some remarkably handsome works of art in bronze groups and statuettes, marble and ormolu clocks, and other articles.

FIRE AND BURGLAR PROOF SAFES.

THE trades represented by this Journal being peculiarly liable to the special attentions of the "gentlemen of the crowbar," we have thought it fitting to devote a short space in our first number to the consideration of the best means of rendering such attentions unprofitable to the occupants of "Thieves' Alley" or "Rogues' Walk."

The frequent jewel robberies during the past few years prove that burglars have attained such a degree of adroitness and efficiency in their profession, that ordinary iron safes offer little resistance to their endeavours, but are opened with as much ease and confidence as if they were mere wooden boxes. Indeed, so far from affording any security, they serve as mere indicators to point out the proper point of attack, and so save the burglar's valuable time. The making of a safe fireproof for books is comparatively an easy matter, but to the watchmaker and silversmith it is vastly more important to have protection against thieves, as he can insure against fire, but if his stock be clandestinely removed, no insurance policy can cover the risk, and he must bear the loss as best he may. It is therefore to him a capital consideration how best to insure his stock against the special risk to which his avocation exposes him, and for which, in most cases, he would pay a high premium if the guarantee of a responsible office were available. The art of burglary, says the *Engineer*, has all but risen to the dignity of a science, developing, in the best men of the fraternity of thieves, skill which, if applied to honest labour, would lead to eminence. Mechanical engineering loses nothing in such hands, and we question if the practical forces of nature is better understood in the great workshops of the country than in "Thieves' Alley" or "Rogues' Walk." The fact that valuables in a portable form are lying within reach is sufficient to make it a keen incitement for them to exhibit the utmost amount of skill and caution in planning and carrying out the details of a bank or jewel robbery, that we seldom hear of failure or a bungling attempt being made; yet how comparatively few watchmakers think it worth their while to have more than a mere iron shell, which is dignified by the name of safe! The great Cornhill robbery, some years ago, startled the trade by the ease with which the iron safe was opened, and yet this safe was stronger than ninety-nine out of every hundred to be found in our silversmiths' shops. In a letter of that time by Mr. Chatwood to the leading Journal, in answer to a taunt that safe-makers had not kept pace with burglars, he pointed out, that for years he had been prepared to make safes, which from the principles of construction could not be opened, but that, owing to the parsimony of the trade, there was no demand for safes of a higher price than the one recently opened at Mr. Walker's, whereas his safe would be many times more money. In 1860 Mr. S. Chatwood took up the question of defence *v.* attack, and by the introduction of sound mechanical principles has gradually raised the manufacture of fire and burglar proof safes to rank as an important addition to practical engineering. Her Majesty's Privy Council have marked their appreciation of the value of his original invention by advising that such patent be prolonged for a further term of five years. Moved by the responsibility attaching itself to a trade so peculiar, Mr. Chatwood has ever laid it down as a principle, that the risk and not the price should be first ascertained; and then, that an article more than equal to the risk be produced, and a fair profit added, which if the trade would not pay, they should be left without excuse in the event of robbery.

Acting upon this principle, Mr. Chatwood patented in 1860 his "Intersection" of hard and soft metals, and his "Invincible Lock," under which patent all his "Intersected" steel safes are made. His next improvement of moment was the "Tee Frame," which was invented and patented by him in 1862. In the year 1865 he invented and patented the "Solid Flange Lock Case," the "Stud Bolt," the "Hook Bolt," and the "Claw Bolt." In 1866 he introduced the "Platinum Plug Lock." In 1867 he accepted the International Safes' Challenge at Paris, which has been so graphically described by Mr. George Augustus Sala in his "Battle of the Safes." In 1868 he patented and perfected a system of welding safes in one solid mass, and in so adapting his patent "Tee Frame" as to overlap the front edges of the safe body; and in the same year he also introduced a most valuable improvement, termed his "Patent Mid Tee Frame," for rendering double-door safes equal in strength to single doors. We have not mentioned his invention for making a watchmaker's shop itself a safe, or his patented strong rooms for banks, comprising as they do the result of much thought and ingenuity in adapting means to an end. The patents for the inventions and improvements alluded to being vested solely in Chatwood's Patent Safe and Lock Company, Limited, of Bolton, it will

be well for purchasers to satisfy themselves that they procure safes direct from the manufacturer, either at Bolton or at their London Depot, 120, Cannon-street, especially such as "Intersected Steel," "Overlapping Tee Frame," "Solid Flange Lock Case," safes with bolts that move in a line parallel to edge of door, &c., &c., and which are the sole inventions and improvements of Mr. Chatwood.

The editor of *Iron*, writing on this subject, says, "Mr. Chatwood stands alone as an example of the thorough concentration of inventive faculty and mechanical skill, orderly perseverance and indomitable energy, devoted to the conception and development of one special aim," and he may justly be congratulated on having succeeded in demonstrating to the world that, by the application of correct engineering principles, defence is rendered more formidable than attack, and that the question of perfect immunity from the depredations of scientific burglars is, after all, merely one of cost.

At the recent Vienna International Exhibition, Chatwood's safe was pitted against the world for 1000*l.*, but, after the experience of Paris, no one was found to take up the challenge, and the "Chatwood" was awarded the only medal of any sort for burglar-proof safes. At the Manchester Exhibition this year are exhibited a good selection of these safes and bank-room doors, one of the latter weighing some two tons, embodying Mr. Chatwood's latest improvements. This door is one of two, for a steel strong room, which the Chatwood Safe Company are now erecting for a bank. This strong room, with its inner safes, will weigh nearly forty tons, being the largest steel safe in England, and of which we hope to give a description on a future occasion.

Meantime we commend to our friends the consideration of insurance by adopting Chatwood's safes of a high quality, treating the rate of depreciation as a premium, and in this way they may leave their valuable stocks securely insured.

These safes are sold subject to a trial of thirty-six hours with any kind of burglar's appliances before delivery, in which they stand alone; but while this offer seems somewhat bold, it is a perfectly safe one, as by the various arrangements introduced, the amount of forcing power capable of being brought to bear is reduced to an almost nominal figure, while the holding is infinitely in excess.

PRESENT VALUE OF GOLD IN THE COMMERCIAL WORLD.

THE existing stock of gold in the commercial world at the present moment exceeds 1,000,000,000*l.* (one thousand millions) sterling. It would be interesting to ascertain how much of this enormous sum is in the form of gold coin, but so far as we know there are no means of determining the question. The productiveness of the mines reached its maximum in 1856, when the aggregate output was 32,000,000*l.*:—United States, 15,000,000*l.*; Australia, 14,000,000*l.*; and Russia, 3,000,000*l.* Since 1856 the yield has been declining. Last year the estimate is 19,250,000*l.*, of which Australia produced 8,752,000*l.*, the United States no more than 6,000,000*l.*, and Russia, 4,500,000*l.* It will be noticed that the falling-off has been by far the greatest in the mines of the United States. In 1856 they were the most productive. Last year they yielded little more than two-thirds of the output of the Australian mines, and not much more than one-third of their own production in 1856. There was a great falling-off in the yield of the Australian mines also. But, on the other hand, there was an increased productiveness in the Russian mines, very considerable relatively, though absolutely not large. Allowing for the 3,000,000*l.* to make good wear and tear, the additional supply last year, to meet the demands for all the world both for coinage purposes and the arts, was but little over 16,000,000*l.*, or not greatly more than half the additional supply of 1856. Assuming that no fresh mines are discovered, it would seem probable, therefore, that the rise of prices due to the increased supply of gold has now reached its maximum. Indeed, if the productiveness of the mines continue to decrease, a fall is not improbable. This would undoubtedly be an advantage. On the other hand, since 1848 trade has received extraordinary extension, as well as extraordinary development. Much more gold is consequently required for the settlement of international engagements. If the decreasing productiveness of the mines should cause a scarcity of metal sufficient to embarrass the money markets, this trade would necessarily suffer.

ELECTRIC CLOCKS.

FOR a number of years the application of that wonderful and mysterious physical agent termed electricity to the controlling and rewinding of clocks has engaged the attention of eminent scientific and practical men, and considerable inventive genius has been expended thereon with different degrees of success. A power so instantaneous and energetic in its action, so cheap and easily procured, so cleanly and free from danger, possesses advantages highly desirable, which at first sight appeared easily applicable to the desired object. Experience has demonstrated that in the controlling of them, as hitherto applied to the pendulum bob, it cannot be depended upon. The slightest variation in the current produces different arcs of vibration, thereby interfering with the isochronism of the pendulum, and consequent variation in time-keeping. Another serious drawback is the fact that at the opening and closing (especially the former) of the circuit, a bright spark passes. At the moment, connection is broken, the intense heat of which oxidizes the metal and materially reduces the strength of the current, owing to increased resistance, and eventually stopping it altogether. Another obstacle is the liability of the battery getting out of order, mainly owing to the rapid consumption of the zinc electrode, and weakening of the exciting liquid. It is this last-mentioned difficulty that has acted mainly against clocks arranged for rewinding at certain intervals. The zinc and liquid have been gradually wasting during the intervals, and, after a few weeks' action, have stopped or required a renewal of the active elements of the battery. We are enabled, however, to inform our readers that a prospectus will shortly be issued relative to an entirely novel invention, recently patented in England, France, Austria and America, by Mr. J. W. Wignall, and now in possession of Mr. David Cowen, of Withy Grove, Manchester, termed the "Self-winding Clock." The advantage of this over all previous attempts lies in the fact that the electric current is applied without the slightest spark, and by an ingenious and simple mechanical arrangement throws the battery entirely out of action during the intervals between the winding, thus suspending all waste of the zinc electrode and exciting liquid, the surmounting of which difficulties render it certain that these clocks will go from one to two years without interference. The barrel and fusee being entirely dispensed with, present several advantages:—firstly, the absence of barrel, arbor, spring, main wheel, fusee, fusee ratchet, &c., reduces the cost in producing the movement, and at the same time reduces the requisite propelling or motive power to the merest fraction; and, secondly, the liability to broken springs, chains or clickwork, and likewise the cost of their renewal or repairing, which in these clocks will be altogether obviated. The battery has in all other instances been detached from the clock, but in the one under review it forms part and parcel of the clock itself, and is enclosed in the same case without increasing the bulk or interfering with its appearance. It is a well-known fact, that a great amount of money is paid annually for the mere winding of clocks, especially on the railway lines, private residences, warehouses, banks, church and turret clocks. In all these cases it will be a positive boon in the saving of expense alone. Other advantages and details will be fully and clearly set forth in the forthcoming prospectus, and which, coupled with a careful inspection of the clock alluded to, will doubtless attract the full attention of the trade, and secure the patronage of the general public.

WHY GOLD CHANGES COLOUR.—It is well known that the human body contains various humours and acids similar in action to, and having a like tendency towards, baser metals, as nitric and sulphuric acids have, viz., to tarnish and dissolve them, varying in quantity in different persons; and of which theory we have abundant proof in the effects which the wearing of jewellery produces on different persons. Thousands wear continually, without any ill effect, the cheaper class of jewellery with brass ear-wires, whilst if others wore the same article for a few days, they would be troubled with sore ears; or, in other words, the acids contained in the system would so act on the brass as to produce ill results. Instances have occurred in which articles of jewellery of any grade below 18 carat have been tarnished in a few days, merely from the above-named cause. True, that these instances are not very frequent, nevertheless, it is as well to know them, and they are sufficient to prove that it is not in every case the fault of the goods not wearing well—as it is generally called—but the result of the particular constitution by which they are worn.—*New York Watchmaker and Jeweller.*

TRADE GOSSIP.

LONG, heavy, pendant earrings are coming into fashion again in America.

THE *Jeweller's Circular* of New York says that Chicago thieves complain that the jewellery they are compelled to steal out there is of the kind that you can take "your choice from for one dollar."

THE Duchess of Medina-Cœli has in her possession a pearl necklace which is composed of twelve strings of large and rare pearls, and is valued at \$5,000. When worn, the upper string fits round her throat, whilst the lowest falls to her waist.—*New York Jeweller*.

A MICHIGAN watchmaker has just finished the construction of a calculating machine, on which he has been engaged for several years. It is described as a very complicated contrivance, with more than 2100 specially formed pieces of machinery, mostly of steel, and put together compactly. Its calculations not only cover the four simple rules in integral numbers, but likewise a variety of difficult problems besides.—*Ibid*.

THE celebrated house of Christoffe & Co., of Paris, has introduced a new style of bronze or copper work, ornamented with gold and silver, and to which the name of *bronze incrustes* has been given.

BIRMINGHAM jewellers are doing a brisk trade with South America, Mexico, and the West Indies.

LOCKETS representing tortoisés, richly mounted in various coloured gold, are very fashionable in Paris.

SINGULAR ROBBERY OF JEWELLERY.

AN extraordinary charge of robbery was recently heard at the Northern Divisional Police-court, Dublin. Three men, named Jas. Reynolds, Wm. Butler, and Jno. Hanley, described as betting characters, were charged with having stolen 30 dozen of diamond and other rings, of the value of 3000*l.*, the property of Messrs. George, of King's-terrace, London, jewellers. Mr. George deposed that he was a passenger on board the City of Dublin Steam Packet Company's steamer *St. Patrick*, from Liverpool, on Monday, and had brought with him three valises, containing six cases of diamond rings and other things, of the value of close upon 3000*l.* He placed the cases under the cabin table. From what he learned from the steward, he looked for the valises about midnight, when the steamer was nearing the Bailey Light, and found that two of them had disappeared, and that the other had been tampered with; that all the rings, amounting to thirty dozen, were gone. Charles Davis, steward of the *St. Patrick*, stated that he saw Mr. George place the valises under the table in the cabin. About twenty minutes before midnight he noticed Hanley and Butler sit down at the table, and after a short period rise and remove the three valises. After some little time they returned and brought back one valise. Witness had feigned sleep, and from a sofa watched the proceedings, and immediately informed Mr. George, whose berth was in the same compartment with Hanley. The captain was also communicated with, and, after some consideration, it was determined to arrest the prisoners, who were found standing together on deck near the stern. The captain and some of the crew accordingly surrounded them, and, as they did so, Butler fell back and dropped something, which appeared to be a large handkerchief rolled up, overboard. Witness heard the parcel strike against the side as if it contained something very heavy. The steamer was then abreast of the Bailey lighthouse. The prisoners were kept in custody until the arrival of the vessel at the North Wall, when they were handed over to the police. Captain Ewer and two of the crew of the *St. Patrick* corroborated the evidence of the steward. The prisoners were remanded.

USE OF GOLD IN ARTIFICIAL GEMS.—Gold and its salts are employed in the preparation of artificial gems. In the artificial topaz 1 grain of gold in 1000, with 30 or 40 grains of antimony-glass, has been detected. In the best specimens of the fictitious ruby we have a similar mixture, but the yellow is changed to red by remelting in the oxidizing flame of the blow-pipe. In the artificial amethyst and the Syrian garnet we have either the purple of cassius with oxide of cobalt or fulminating gold with antimony. The perfection of some of these fictitious gems is such as to deceive many. The great crucial test for gems, their hardness, can, however, soon decide between the genuine stone and the most perfect imitation, which, after all, is nothing but coloured glass.

HALL-MARKING OF JEWELLERY, &c.—Some time ago the Society of Arts offered a prize of £25, placed at their disposal by Mr. E. W. Streeter, for an essay on this subject, with suggestions for an improved system. Seventeen essays were sent in for competition, but as none of them were of a sufficiently comprehensive character to justify the committee in selecting any one for the prize, they recommended the Council, with the assent of Mr. Streeter, to renew the offer. Mr. Streeter having given his assent to this course, the Council have now renewed the offer of the prize. It is suggested to competitors that the essays shall treat on:—*a.* The history of hall-marking in this country, showing, with some degree of detail—*b.* The processes adopted and now in use. *c.* The merits and demerits of the present system, and how far it meets the wants of the public on the one hand, and satisfies the manufacturer on the other. *d.* If any system desirable, what should it be, and by whom, or under what authority should it be carried out? *e.* The systems in use in foreign countries, and how far they meet the wants both of the public and the manufacturer. The essays must be sent in not later than the 1st of June, 1875, marked with a motto or cypher only, accompanied by a sealed letter, with the corresponding motto or cypher marked outside, giving within the name and address of the writer of the essay. The Council retain the right of publishing the prize essay in the *Journal*, and they reserve the right of withholding the prize altogether, or of awarding a lesser sum, if the judges shall so recommend.

THE DURATION OF LIFE.—In ancient Rome, during the period between the years 200 and 300 A.D., the average duration of life among the upper classes was 30 years. In the present century, among the same classes of people, it amounts to 50 years. In the sixteenth century the mean duration of life in Geneva was 21·21 years, between 1814 and 1833 it was 40·68 years, and at the present time as many people live to 70 years of age as, 300 years ago, lived to the age of 43. In the year 1693 the British Government borrowed money, the amounts borrowed to be paid in annuities, on the basis of the mean duration of life at that time. The State Treasury made thereby a good bargain, and all parties to the transaction were satisfied. Ninety-seven years later, Pitt established another tontine or annuity company, based on the presumption that the mortality would remain the same as 100 years before. But in this instance it transpired that the Government had made a bad bargain, since, while in the first tontine 10,000 persons of each sex died under the age of 28, 100 years later only 5772 males and 6416 females died under this age. From these facts it appears that life, under certain favourable influences, has gained in many and probably in all its forms and manifestations, both in vigour and duration. To still further promote this tendency, it is only necessary that those conditions under which the attainment of the desired end is possible be made to accord with the fundamental natural laws.—*Deutsche Versicherungs-Zeitung*.

THE casting of the statue of the late Prince Consort, to be placed under the dome of the Albert Memorial in Hyde Park, has been completed at the foundry of Messrs. Prince & Co., Southwark. The figure is seated in a chair of state, and is of colossal size, being 15 ft. in height from the base to the crown of the head. The artist, the late Mr. J. H. Foley, R.A., fortunately for the nation, completed the model before his death. The casting was most successful. The statue would have been completed some months since but for an unfortunate accident. The workmen were removing a portion of the mould, weighing some 20 tons, from one part to another of the foundry, when a chain broke, and the vast mass fell to the ground, thus destroying the labour of months, and at a loss to the founders of nearly 400*l.* Fortunately no injury was done to the men. The statue will soon be fixed in its final resting-place.

FACTS CONCERNING THE NOVA SCOTIAN GOLD FIELDS.—	
Total yield of gold, 1861-1874 inclusive ...	236,364 oz.
Total yield from quartz mines ...	228,509½ "
Total yield from alluvial and concentrations ...	2,354½ "
Value of total yield, at £4 sterling per oz. ...	£947,456
Value of yield from quartz mines ...	914,038
Value of yield from alluvial and cement mines ...	9,418
Average yield per ton of 2240 lb., 0·8396 oz. ...	16 dts. 19·67 gr.
Average yield per capita in the mines daily ...	7s. 8·432d.
Total daily number of miners, 1862-74 ...	591
Aggregate number of days' labour ...	2,397,772
Total quantity of quartz crushed ...	302,305½ tons
Number of mills (in operation) ...	17
Aggregate number of stamps ...	130
Greatest depth attained ...	520 feet
Estimated acreage explored under present development	150
Estimated auriferous territory (square miles) ...	3000

STRAY WAIFS AND SCRAPS.

PUNCTUALITY.—Unpunctual persons impede business and poison pleasure. Make it a rule to be as punctual as possible. Such a habit secures a composure which is essential to comfort; for want of it many persons live in a constant fever, and put all about them in the same state.

WHENEVER you buy or sell, let or hire, make a clear bargain, and never trust to "We shan't disagree about trifles."

FRIENDSHIP.—Be not the first to break with a friend. Sorrow gnaws the heart of him who hath no one to advise with but himself.

Few things are impracticable in themselves, and it is for want of application, rather than of means, that men fail of success.

THERE are three kinds of men in this world—the "Wills, the Won'ts, and the Can'ts." The former effect everything, the others oppose everything, and the latter fail in everything.

By relying on our own resources we acquire mental strength; but when we lean on others for support, we are like an invalid who, having accustomed himself to a crutch, finds it difficult to walk without one.

KEEP doing, always doing; and whatever you do, do it with all your heart, soul, and strength. Wishing, dreaming, intending, murmuring, talking, sighing, and repining, are all idle and profitless employments. The only manly occupation is to keep doing.

SAFE MAXIMS.

1. Firmly resolve never to owe a debt.
2. Acquire promptly and thoroughly some useful calling.
3. Resolve not to be a rover: where you have stuck your stake, stand by it.
4. Comprehend that there is work almost everywhere for him who can do it.
5. Realize that he who earns sixpence a day more than he spends must get rich; while he who spends sixpence more than he earns must become poor.

A CURIOUS GEM FROM LAKE SUPERIOR.—The *New York Watch-maker and Jeweller* says, "Dr. Van R. Rieh, of Oswego county, possesses one of the most curious gems that has ever been brought before the attention of connoisseurs, and is pronounced by jewellers and others to be among the most exquisite of Nature's specimens, and for which experts have been perplexed to find a name. It was found by a Huron Indian on the shores of Lake Superior, and is a compound of four classes of stones blended together so as to constitute a perfect gem of rare beauty. The stones comprised in it are agate, cornelian, perite, and crystal. Among the other remarkable features of this curious gem are the appearance upon each side, as if from the hand of an engraver, of a resemblance to a miniature crown, the clearly-defined forms of a black-and-tan dog, the head of an owl, the tracings of the shores of little lakes, and other remarkable phenomena rarely, if ever, found in stones of any kind.

ALLEGED ROBBERY OF JEWELLERY.—Hector J. Pullan, of 6, Addison Road, was brought before Mr. Knox on the charge of stealing jewellery, above 2000*l.* in value, from his employers, Messrs. White & Campbell, jewellers, of New Bond Street.—Mr. Ryan prosecuted, and Mr. Poneione, jun., defended.—Mr. Ryan having opened the case, called Mr. Thomas Gammon, pawnbroker, of Sloane Street, who produced a bracelet pledged on April 15, with other articles, by the prisoner, for 40*l.*—In reply to Mr. Poneione, the witness said the prisoner left the contract notes for the articles in his possession.—Mr. Thomas White, of the firm of White & Campbell, identified the articles produced, and said they bore the stock marks of the firm, and were missed when stock was taken.—In reply to Mr. Poneione, the witness said the articles were purchased from the manufacturers, and other houses might have similar goods supplied them by the same manufacturers, but they bore the marks of his partner, who would attend on a future occasion.—Detective-sergeant Meiklejohn said he apprehended the prisoner, and on telling him the charge he exclaimed, "Good God, do you mean it?" and witness then told him that he had found 400*l.* worth pledged in Sloane Street. Witness found a jewellery case and a pistol and ammunition.—In reply to Mr. Poneione, the witness said the pistol was not loaded, but the prisoner had some ammunition in his pocket.—Mr. Knox remanded the prisoner, and refused to accept bail.

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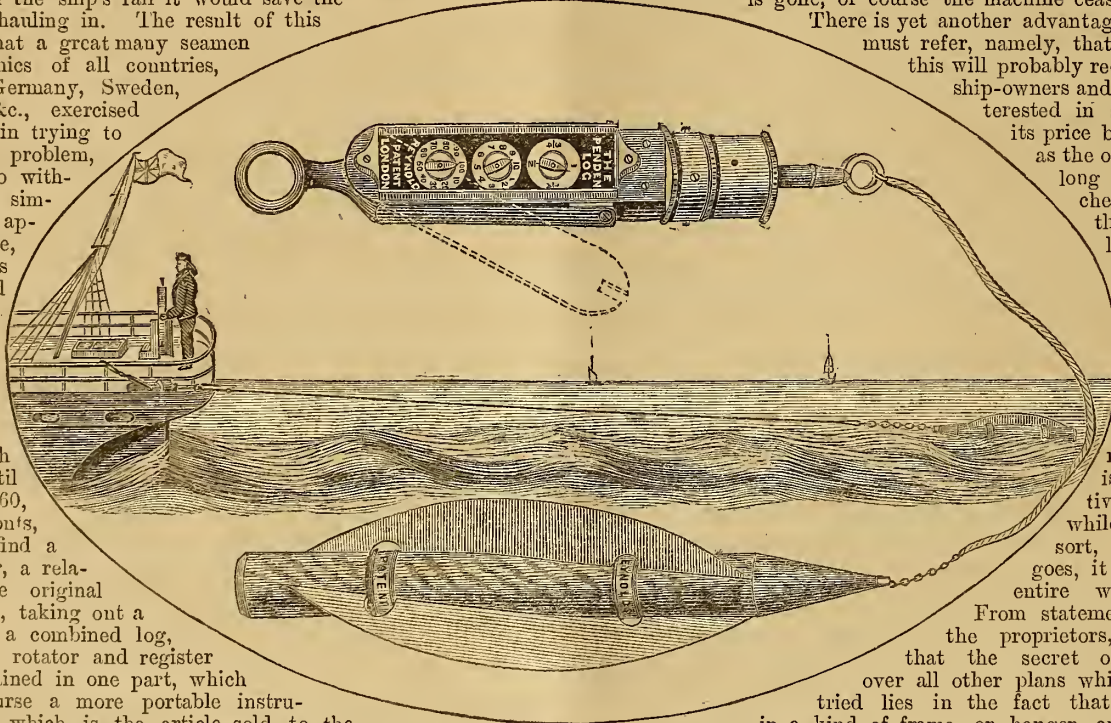
IMPORTANT IMPROVEMENT IN RECORDING LOGS FOR SHIPS.

ABOUT 115 years ago a certain Mr. Massey, of Clerkenwell, devised an instrument for measuring the speed of streams or currents, which invention, it seemed to him, would also be useful for measuring the distance run by ships. He accordingly arranged one for that purpose, and which was constructed in two parts, viz., the "register" and "rotator," the former being a flat brass box somewhat of the shape of a partly-opened fan, the small end being provided with an eye, to which was attached a rope about thirty-five or forty fathoms long, for the purpose of towing the apparatus; at the broad end was also an eye attached to a spindle, which was caused to revolve by means of the rotator, which was a metal tube having a conical end in front, and fitted with four vanes, or blades, placed at an angle attached to the register by means of a piece of rope, the end of which was also fastened to the spindle eye just mentioned, the complete machine being towed in the water at the stern of the ship. For some time this appeared to be all that was needed, yet it must have occurred to some one, possibly of lazy propensities, that if the register could be fixed on the ship's rail it would save the trouble of hauling in. The result of this idea was that a great many seamen and mechanics of all countries, America, Germany, Sweden, Holland, &c., exercised their skill in trying to solve the problem, but hitherto without success, simple as it appears to be, and things remained

pretty much the same until the year 1860, or thereabouts, when we find a Mr. Walker, a relation of the original Mr. Massey, taking out a patent for a combined log, that is, the rotator and register being contained in one part, which was of course a more portable instrument, and which is the article sold to the present time; but we ought to mention that, some years previous to this, a Mr. Friend, of Southampton, produced a very convenient instrument which contained all its mechanisms in one part, but which, not being quite so handy as that of Mr. Walker, the latter gained the good opinion of the seafaring people. The invention now introduced to our readers is that of a pendant log patented by a Mr. Reynolds, of London, and which has been brought out by Messrs. Cohen, Jacob, & Co., Wholesale Opticians, of Ely Place, and by the success it has already met with, we may fairly conclude that it will shortly supersede any other log now in use; its special feature is that its register is attached to the ship's rail, and can therefore be referred to at any time without the necessity of hauling in, the rotator only being towed in the water. This, it may be said, is only a matter of convenience, but certainly not a small one, especially in cold weather; when every one on deck is pretty well benumbed, to have to handle about forty fathoms of wet line is not one of the most enjoyable things possible; but apart from all consideration of convenience, there are others, which, perhaps, are far more important. Those now in use are frequently fouled by seaweed or engineer's waste thrown overboard from steamers, and get entangled in wreckage or fishing sets, or, which is more singular, if not uncommon, bitten off by large fish, such as

sharks, they, it seems, having a particular fancy for anything moving in the water, especially if it be of bright metal, whereas, one of the chief advantages of the "Pendant Log" is, that although the propeller, or rotator, as it is usually called, is subject to be carried away the same as any other appliance which must necessarily be towed in the water, still the moment this has occurred it can be detected by a glance at the register, which, of course, ceases to work and a fresh rotator can be immediately applied. Supposing the night to be stormy and the ship running on a dangerous coast, the log is set when a light is sighted; the distance to the next one being known to a nicety, it is evident that the safety of the ship is almost entirely depending on the log; but there is no possible means of knowing whether it is still attached to the line or not, except by hauling in and examining it, the continual doing of which renders the instrument useless, since it would be best half of its time out of the water. But with the "Pendant Log," the register of which being fixed to the rail, it can be examined at any moment, or even easily felt with the hand in the dark, because, if the rotator is gone, of course the machine ceases to register.

There is yet another advantage to which we must refer, namely, that of cost, and this will probably recommend it to ship-owners and all who are interested in ship supplies; its price being the same as the old sort, in the long run it is cheaper, because the only part likely to be lost is the



rotator, which is of comparative little value, while in the old sort, if anything goes, it must be the entire working part.

From statements made by the proprietors, it appears that the secret of its success over all other plans which have been tried lies in the fact that it is slung in a kind of frame, or hanger, and its pivots, or trimmings, are so placed that the weight is balanced, thus preventing any unequal friction against the sides of the spindle. It can be well imagined that the turning power of the rotator having to be transmitted along 230 feet of thin rope, a very slight hitch anywhere about the spindle would cause the rope to become full of turns or knots, indeed it would very soon be ever hopelessly entangled, and hitherto this has been the difficulty, but, owing to the aforesaid method of slinging, the spindle always gets a fair, straight pull; even supposing an eye or a ring to be fastened to the end of the register instead of the sling; for the purpose of turning the weight of the log resting on the spindle is sufficient to prevent it working correctly. The shoulder of the spindle works on anti-friction rollers, which are of hardened steel, and these again bear on hard steel plates, it having been found that nothing else will resist the wear sufficiently, and thus made, we are told that they have been used for many thousands of miles without showing any undue signs of wear. Doubtless this great improvement in recording logs is destined to supersede all others now in use, and those interested in such an article will do well to inspect it at the manufacturers', where every information can be had.



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HOROLOGY.

II.—PHILOSOPHICAL DISSERTATION CONCLUDED.

AT the conclusion of our last paper we promised here to give some information with respect to "the dawn of horological mechanism from the earliest ages." That promise we are unable to fulfil in our present number, on account of the simple fact that the train of philosophical thought was so powerfully attractive that we were obliged to follow it to the end. We also trust that the knowledge which we have penned in that direction may not be without its influence upon the thinking faculties of those for whom we have chiefly written. We will shortly mention the labour that scientific writing involves. The value of a well-informed intellect does not consist so much in what the very limited memory of a man may be able to retain, as to know where to go and get exactly the book he wants when he wants it. As an illustration of this we have always endeavoured to make our memory more of an index to the special volumes of scientific knowledge, which it is our happiness to cultivate, than what necessarily must be a superficial smattering of the text of the volumes themselves. What is a book without an index? Let the reader answer for himself, and, when he has done so, he will have no difficulty in solving the supplemental problem of what a brain is without an index. He may depend upon it that a well-indexed brain that can "pitch" upon the volume it wants is far more useful to its owner than if it was stuffed to the full with odds and ends of all kinds, without being readily able to know where "further particulars," as the newspapers say, can be reliably obtained. As we are about to say something in our next of the early methods of time-keeping, and as we had not the felicity to live

in the days of ancient Egypt or imperial Rome, so as to have seen the various instruments with our own eyes, we are forced to confess that we must get what we write from books. We hope that we shall be forgiven, as, after what we are about to say, the cynical reader is quite welcome to do the same thing, and so save himself the trouble of reading this article any further.

First of all, we spent an entire afternoon among the references in that unrivalled intellectual storehouse, the reading-room of the British Museum. We subsequently digested what we read, and we have now before us, during the present writing, some half-dozen goodly volumes, one of them being in Greek and one in Latin. Any one who chooses, therefore, to follow our course of action will readily discover how easily he may toss this paper on one side and have done with it if he pleases.

The late Mr. Charles Frodsham, than whom no man living was entitled to raise his voice with more authority, thus speaks, in his "Elements of Watch and Clock Making," of the value of book-learning, in its way, to the man of chronometric mind:—

"One of the most important facts in the advancement of every art and science is the knowledge of its literature. There are many valuable books on horology, which, though not up to the last idea, are at least valuable beacons to avoid the waste of time in making researches already known; 'and the student,' in the language of an eminent writer, 'instead of trusting to the resources of his own single mind, must ransack a thousand minds, and thus make use of the accumulated wisdom and experience of ages, so that he may take his point of departure from the last line and boundary to which science has advanced.' I refer to this point the more strongly from what I daily witness in the failure of almost a life-time spent upon abandoned mines of invention, arising from this very want of knowledge; thus the world has often passed by men who have thus employed them-

selves, and left them in the rear instead of in the van of science, to which place, perhaps, their industry and natural talent would otherwise entitle them.

"At the International Exhibition, amidst the galaxy of mechanical skill and ingenuity, which sometimes seemed almost endless in its vast variety of combinations, many old schemes were presented to us as new, with an apparently perfect ignorance of their authors that they had long been rejected as valueless, whilst others exhibited the same identical principles, claiming them as inventions which might be possible; but a perfect knowledge of the progress of the art would have prevented much of this. Mechanical scheming is so fascinating that, as long as the world lasts, men will indulge in the hope of discovering perpetual motion and perfect time-keeping by the *remontoir* escapement—the watchmaker's philosopher's stone. Valuable inventions might be almost stumbled upon in the early history of mechanical progress, but now the discovery of new principles is rendered a thousand times more difficult, and shows the necessity of being well up in the progress of the art. Indeed, I think there is little doubt but there has been more time spent by great minds upon clocks and watches than upon any other art or science; and they may be truly said to have been the nursery of engineering and manufacturing skill. There are but few new or important inventions in any of the horological sections, though there were many very clever adaptations of old principles to new processes; yet no competent judge ever for a moment supposed that this arose from any want of mechanical genius, but rather from the advanced knowledge of the art, that watchmaking had never been fully developed and understood, and that the principles hitherto in use are still open to further researches and discovery. There is a great difference between discovery and invention. Arnold invented the compensation balance, but another may discover its minute error, together with its cause and remedy. Graham left us his beautiful astronomical-clock escapement and mercurial pendulum, but both are almost the study of a life-time to bring these principles to that perfection that we shall have an almost unerring astronomical clock. Mr. Denison, in his recent work on clocks and watches, has treated this subject in an able manner, yet, from the want of accurate data and more extended experiments, he has left the subject incomplete. But so it is, for, although 150 years have passed away, we are still making experiments to discover the disturbing causes which interfere with the isochronism of the pendulum."

This was written in 1862, and, as the writer was not only an eminent scientific and practical horologist, but one of the jurors of the Horological Section of the Exhibition as well, he had ample opportunities of ascertaining the worth of an intimate acquaintanceship with horological literature. We will now proceed a little further on our way.

There has been some "learned" spider-thread splitting as to what the meaning of Time is. Those who are very fond of diversion of that kind and wish to be particular can, no doubt, find ample material to work upon; indeed, the question may be fined down to an equality with that celebrated one of what were called "the schools" of some centuries ago, when much ink was shed and much noise wasted throughout Europe in the endeavour to settle how many angels could dance on the point of a needle!

"Time," says the celebrated French astronomer, Laplace—"time is to us the impression left on the memory by a series of events, the existence of which we are sure was successive. Motion is suitable to serve as a measure for it, because a body not being capable of being in several places at once, incapable of ubiquity, must, in passing from one place to another, occupy successively all the intermediate parts. If, at each point of the line described, it is animated by the same force, its movement will be uniform, and the portions of that line may measure the time employed in traversing them."

Here is a text upon which the more philosophical youths of the watchmaking trade may compose sundry agreeable and instructive horological sermons; they will see that all contrivances, from the clepsydra of a buried world to the mercurial pendulum of to-day, are bound up with it.

Let us see who was Laplace, and why he was celebrated, before we commit ourselves to his definition of Time.

Pierre Simon Laplace first saw the light at a small rural place called Beaumont-en-Auge, near Honfleur, his father being a farmer. He received a good mathematical education. He went to Paris at the age of eighteen, just as we come from the country to London to find the streets that we were told had gold pavers. He had letters of introduction to D'Alembert, the famous scientific star of his day. Curiously enough this celebrity was an abandoned child, the police having made him over to the wife of a Paris plumber, who wanted an adoption. The plumber's wife was a very matter-of-fact woman, for, when her foster-son had made some publicity by his

writing, she would, on seeing a new book of his, shake her head sorrowfully, and exclaim, "You will never be anything but a philosopher—and what is that but an ass who plagues himself all his life, that he may be talked about after he is dead?" To such a worthy as this philosopher did Laplace send his letters of introduction, but no notice was taken of them. He then hit upon another plan. He wrote a letter upon certain principles of mechanism, the reading of which so pleased the great man that the young aspirant was immediately sent for. "Ha!" exclaimed D'Alembert, on meeting him, "you have found out a better way of claiming my attention than by letters of introduction." Here is a valuable hint to our young readers when they want to get within earshot of their superiors. Laplace sent a specimen of his handiwork; he showed the other what stuff he had in him, apart from unheeded letters of introduction. The next step was a chair of mathematics in the Military School of Paris, on D'Alembert's recommendation, in 1768-69. From that he went on until he reached a pinnacle of comparison with our own Sir Isaac Newton—by Freuchen, thought even greater. His grand work was the "*Mécanique Céleste*," in five large quarto volumes and two supplements. This production embraces the laws of equilibrium and motion, the figures of the celestial bodies, the oscillations of the sea and the atmosphere, the motions of the celestial bodies, the theory of the moon and the more distant planets, and the system of the universe generally. He also wrote a book called, "*L'Exposition du Système du Monde*," and two others on the theory of probabilities. He died in May, 1827, his last words being akin to those of other great men who lived before him: "That which we know is very little; that which we do not know is immense."

(To be continued.)

EFFECTS ON ARTISANS EMPLOYED IN WORKING IN METALS.

WORKERS in metals may be considered under five heads, as workers in arsenic, copper, lead, mercury, and, lastly, workers in gold and silver.

Arsenic.—The fumes of arsenic are extremely pernicious. It is an artificial production, and is prepared principally in Saxony from cobalt ores. Whilst the latter in the crude state are roasting for the purpose of obtaining zaffre, the vapours arising from the oxide are condensed in a long and large chamber, and to these potash is added. The mixture is then sublimed, and the white oxide is obtained, leaving potash with sulphur. This employment is a dangerous and, in a short time, fatal one; and accordingly convicts, whose punishment would otherwise be death, are condemned to it. The men in the copper-smelting works of Wales and Cornwall are affected by the arsenical vapours arising from the crude ore, and they rely upon oil as an antidote, with which they are supplied by their employers. They are sometimes attacked with a cancerous disease similar to that which infests chimney-sweepers. The arsenical fumes are believed to exempt them from fever. Some other artisans, as, for instance, paper-stainers and glass-workers, occasionally use arsenic and suffer headache and sickness from its employment.

Mercury.—More than a century ago, Jussieu gave an account of the workmen in the quicksilver mines of Almaden, in the province of La Mancha in Spain. "The free workmen at Almaden," he says, "by taking care on leaving the mine to change their whole dress, particularly their shoes, preserved their health and lived as long as other people; but the poor slaves who could not afford a change of raiment, and took their meals in the mine, were subject to swellings of the parotids, apthous, sore-throat, salivation, pustular eruptions, and tremours."

Gold and Silver.—Workers in gold are subject to several pernicious vapours, the worst being that which arises in the process of dry colouring, from the fusion of saltpetre, alum, and common salt. It produces great distress in the head and nervous system. These evils are aggravated by a bad posture and the foul air of crowded work-rooms, so that an old jeweller is seldom met with. A communication made to Mr. Thackrah, by a master, is interesting and pathetic. We give it, though gloomy, as it is not by concealing the evils of trade that they are to be remedied:—"The men drop off from work unperceived and disregarded. I am quite at a loss to know what becomes of them. When they leave off working, they go, and are seen no more. Some, perhaps, become applicants for charities, but so few have I known of the ages of sixty or seventy, that, leaving work, they seem to leave the world as well—a solitary one appearing at intervals to claim some trifling pension, or seek admission to an almshouse." Workers in silver have a tolerably healthy occupation; they suffer but little from effluvia, with the exception of some who work in badly-constructed work-rooms.

FINGER RINGS.

(Continued from page 6.)

WE do not always look for wisdom in the rulers of the earth, and therefore need not be surprised that a superstitious observance was upheld by the kings of England. Similar to the curious practice of touching for the king's evil was that of hallowing cramp rings. Every Good Friday the king hallowed, with much ceremony, certain rings, the wearers of which were saved from the falling sickness. The practice took its origin from a ring long preserved with great veneration in Westminster Abbey, which was supposed to have great efficacy against the cramp and falling sickness, when touched by those who were afflicted by either of those disorders. The ring was reported to have been brought to Edward the Confessor by some persons coming from Jerusalem, and to have been the same that he had long before given privately to a poor man who had asked alms of him for the love he bore to St. John the Evangelist. In the "Liber Niger Donus Regis Edw. IV." is the following entry:—"Item to the kynge's offerings to the crosse on Good Friday out from the countynge-house for medyeinable rings of gold and sylver delyvered to the jewel house xxvs." The practice was discontinued by Edward VI., but in the previous reign Anne Boleyn sent some rings to a Mr. Stephens, with the following letter:—"Mr. Stepheus, I send you here cramp rings for you and Mr. Gregory and Mr. Peter, praying you to distribute them as you think best."

Inscriptions upon rings were common in olden times, and it is supposed that the fashion of having mottoes, or "reasons," as they were called, was of Roman origin, for the young Romans gave rings to their lady-loves with mottoes cut on gems, such as "remember," "good luck to you," "love me, and I will love thee." In the fourteenth and fifteenth centuries the posy was inscribed on the outside of the ring, and in the sixteenth and seventeenth centuries it was placed inside. In the year 1624 a little book was published with the following title:—"Love's Garland; or Posies for Rings, Handkerchiefs and Gloves, and such Pretty Tokens that Lovers send their Loves." Some of these mottoes have become pretty well hackneyed in the course of years; thus the Rev. Giles Moore notes in his journal, under the date 1673-74, "Bought for Ann Brett a gold ring, this being the posy—'When this you see remember me.'" In some cases instead of words the stones are made to tell the posy by means of acrostics; thus, to obtain *Love*, the following arrangement is made—

L apis lazuli,
O pal,
V erde antique,
E merald;

and for *Love me*, malachite and another emerald are added.

For the words *Dearest* and *Regard* the stones are arranged as follows:—

D iamond,
E merald,
A methyst,
R uby,
E merald,
S apphire,
T opaz.

R uby,
E merald,
G arnet,
A methyst,
R uby,
D iamond.

In one of these rings belonging to a gentleman the lapis lazuli dropped out, and he took it to a working jeweller in Cork to be repaired. When he got it back, however, he found topaz in place of the lapis lazuli, and therefore he told the workman a mistake had been made. "No mistake," answered the jeweller; "it was Repeat; let us Repeat, and we may have it yet."

(To be continued.)

MARBLE can be stained different colours by the following substances; blue, solution of litmus; green, wax coloured with verdigris; yellow, tincture of gamboge or turmeric; red, tincture of alkanet or dragon's blood; crimson, alkanet in turpentine; flesh, wax tinged with turpentine; brown, tincture of logwood; gold, equal parts of verdigris, sal ammoniac, and sulphate of zinc in fine powder.

THE GOLDSMITHS' ART.

FROM THE EARLIEST TIMES.

IN enumerating the arts necessary to the goldsmith of the Middle Ages, niello was mentioned as holding an important place. It consisted in filling with a black metallic enamel the fine incisures of an engraving executed on silver. Theophilus, the early writer so often referred to, is the oldest authority regarding it: in his time it had already become an ordinary accessory to the metal-worker. Two centuries and a half later, when wood engraving and printing were becoming known in Italy, a goldsmith in Florence, distinguished for niello engraving, received the credit of having *invented* engraving for printing, or rather, let us say, discovered the practicability of printing from engraved metal plates. This was Maso Finiguerra, than whom "no one ever was known," says Vasari, "to put so many figures in so small a space, and with such correctness of drawing;" and, if we compare his designs with those of other artists then living, we shall find his reputation well deserved. Among the nielli preserved in the Cabinet of Bronzes of the Florentine Gallery, may be seen a pax* executed by Finiguerra, as proved by a public document then existing, in 1452, for the baptistery. This little elaborate work is rendered historical by Finiguerra having been so celebrated by Vasari, and this being possibly the very piece of work he refers to. The only impression of this pax is preserved with great care in the Imperial Library of Paris: Finiguerra, of course, after his discovery, finished his work by filling it with the niello, preventing the possibility of further impressions being taken.

The process of the discovery is thus described by Vasari:—Before pouring the nigellum on the engraving, before, indeed, it was quite finished, wishing to see how it would appear, he proceeded to take a mould in clay, according to the custom. From the clay mould, a cast in sulphur was obtained, into which he rubbed lamplack, and so had an exact representation of the original when completed and filled with the nigellum. It occurred to him, when thus employed, that he might preserve a reverse of it, as the lamplack was easily lifted out of the lines by pressure; so he wetted a piece of paper to make it pliable, rubbed it against the surface with a burnisher, and found he had a beautiful impression. He then threw aside the sulphur cast, went over the same process with the original silver plate, and thus the engraver, from being an auxiliary to the goldsmith, became an independent agent of infinitely more artistic importance (1460). Such may have been the process of the early experimental artistic engravers; but we must transfer the scene to Germany, and put back the date perhaps fifty years. It is long since Strutt showed that the date 1460 is really posterior to that on existing prints executed in Upper Germany, and since his time many others have been observed bearing an earlier contemporary character. Martin Schon, whose work is in the highest manner skilful, died in 1486, leaving forty years' good labour behind him; and his master Zwott, or whoever he was, takes us back to the earlier years of the printing press. We have the master of 1466, and the numerous productions of Israel von Mechen, going back to the date spoken of by Vasari, while his master again brings us to an early year in the century.

Immediately the process was known in Italy, many artists began to cut their sketches on copper, or, as it is said, on pewter; the goldsmith and painter Pollaiuolo, Baccio Baldini, and a greater than either, Mantegna, being earliest in the new practice. Yet they did not at first sell the impressions; perhaps these were not thought worth anything; but they thus preserved proofs of what they had done, or gave them to their friends. Ptolemy's "Geography," printed in Rome in 1478, was illustrated by twenty-seven maps engraved by two Germans; and in 1481 appeared in Florence an edition of Dante, embellished by engravings by Baccio Baldini, from designs by Botticelli, not printed on the pages, but pasted into spaces left by the types. These are executed with very fine lines of a scratched appearance, such as would not give off very many impressions. Botticelli himself engraved, but more frequently prepared the designs: this disunion of designer and engraver was soon characteristic of Italian practice, where the art very shortly became very mechanical, and, except in the case of Agostino Carracci, it was never practised by an original designer. At first, however, Mantegna adopted the graver; but the artist who elevated it to the highest position, in the opinion of collectors at least, was Marc' Antonio Raimondi. (To be continued.)

* A pax was a small plate decorated with a representation of some sacred or traditional subject; it was furnished with a handle at the back, and, on being kissed by the priest, was handed round the altar rails among the devout, after the *Agnus Dei* in the mass, to receive the kiss of peace.

THE NEW INVASION.

THE New Invasion is upon us; of that there can be no mistake. We believe, therefore, that, in the face of such a self-evident truth, we cannot do a better service to the watch trade all over the empire of Great Britain than rouse attention to the fact. It is no use in scolding at the invading tide, it is here; the resistless wave is silently rising all over England, and we have counselled ourselves to be borne peacefully upon its surface, rather than risk forcible removal and submersion. Having now sounded the tocsin, we will endeavour to give such facts and details of this invasion as we have been able to ascertain.

At the western end of the Viaduct, on the south side of Holborn-circus, facing the Prince Consort's equestrian statue, the rambler in the metropolis will find before him one of those newly-built palaces—monuments of commerce in elaborate stonework—which are the glory of trade and the pride of the modern Londoner. Upon its dark, enamelled, facial band, deeply indented in letters of gold, are the ominous words—

American Watch Company.

These are the invaders, and, before we proceed to give the cause and the method of their invasion, we will tell our readers who they are, and where they come from.

THE WALTHAM WATCH COMPANY, for such is the name of this new, powerful rival, is celebrated, even among the great horological confederations of the United States, as standing in the very foremost rank. It was originally established in 1853, at Roxburg, Massachusetts, but the dust of Roxburg was too strong for its delicate organism. In consequence of that irremediable drawback the company revised itself on a considerably enlarged plan, and removed to the village of Waltham, in the same State, about eight miles from the City of Boston. Here, in a park-like enclosure upon the banks of the Charles River, the remodelled manufactory was built, revived, and put into successful operation, far removed from all disturbing elements, as well of dust as of noise; it has since pursued the prosperous tenour of its way. We have been furnished with some evidence of this prosperity, which we shall lay before our readers towards the conclusion of this article, and which, we believe, will somewhat astonish the "fathers" of our English trade.

The Waltham factory presents the appearance of a double quadrangle, the main-office block closing in the right-hand square. This block, being surmounted with what the Italians call a *campanile*, or bell-tower, rising through the roof of the front elevation, is ornamentally completed, heavenward, by a very tall flag-staff. From this mainmast of one of "Uncle Sam's" cruisers, on high-days and holidays, waves proudly the inspiring "Star-spangled banner." The left-hand quadrangle is again closed in by another main building, whilst beyond, still further to the left, extend three sides of another square of buildings, the fourth line of the square being open. The estate is laid out in gardens, walks, shrubberies, and meadow-land, and is bordered by about 125 villas, cottages, and flower-plots of the managers and work-people. Turning our eyes for a moment into one of the interior departments, we discover three rows of benches running down a rather long room. At these benches are seated work-people, male and female, busily employed at their several avocations. Two rows of engine-shafting and driving-bands give motion to the machinery that is fixed upon the benches—for, as has been stated, nearly everything is done here by machinery—and this room, as well as all the others, presents one quiet atmosphere of healthy work, order, and regularity. Even the traditionally foul-smelling engine-room has, at Waltham, all the adjuncts of a conservatory; the wall shelves are well-stocked with flowering annuals, and the glass portion of the roof is covered with the tangled paths of creeping plants. We have seen large photographs of the works and the surrounding scenery, and they call to mind at once the idea of such a series of similar buildings standing on the banks of our own Thames, on the valley-land sloping down from the beautiful Richmond Hill. Far away, we repeat, from dust and noise, among such pleasant surroundings, are the instruments fashioned that have come into the English market by the thousand to challenge our long-worn supremacy. Such is Waltham.

For almost a generation, if not longer, it has been a strengthening argument all round—from the bench of the artisan in watch-work, the student of the science, and the home of the purchaser—that the watch of the future, in fulfilment of true horological destiny, must be the offspring of automatic machinery. When we say "true horological destiny," we mean that the practical embodiment of horological science shall be a sound, reliable timekeeper within

reach of every man and woman who desires to have one. We all know that, in these days, such is not the case, for there are thousands upon thousands of "runners" made, imported, and distributed yearly among us, that only too sadly "keep the 'beat' of promise to the ear, but break it to the hope." The result of this destruction of the confidence of, we may say, the millions of watch buyers is the fervent wish that, as American mechanical genius has given us the well-known interchangeable rifle, the lock, and the sewing-machine, it would make us its debtors for the faithfully-constructed, interchangeable watch. In December, 1868, a lecture was delivered by Professor Pepper, at the Polytechnic Institution, upon the subject of watchmaking by machinery, about which the *Times*, in its report, thus speaks:—

"For a long time the belief has been entertained that the more delicate parts of the watch can be made *by the hand alone*, and, consequently, that the workmen to whom they afford employment are free from all risk of competition with those stupendous mechanical powers which, in every direction, are encroaching upon the field of manual labour. Now, however, a question arises whether such is actually the case."

There is no question whatever about it *now*, as the reader will most conclusively find further on; and that, too, in a way that must rudely shake the strongly conservative nature of the English working watchmaker.

In the "Artisans' Report on the Vienna Exhibition of 1873," published by the Society for the Promotion of Scientific Industry, we find the following in relation to the watch trade:—

"I do not think there were 100 English pocket watches exhibited in the whole exhibition, and little, if anything, that was new among them. * * *

"In looking round the exhibits of watch manufacturers, I found that there were few attempts at reducing the cost of making up watches. The English watches shown in the Vienna Exhibition are, as far as workmanship, &c., is concerned, as near perfection as possible; but the price asked for such watches demands that it should be so. When £35 is asked for a plain, full-plate lever watch, it is only to be expected that it is the best production of skilled workmen." (Of course, a gold watch is meant.) "What we want, in my opinion, and in the opinion of almost all the watchmakers I have come in contact with, is a watch capable of every-day wear, and keeping reasonably correct time, at a cost making it accessible to everybody. I know our watch manufacturers will say they do supply such a watch; but my experience is against that, for the middle-priced English lever watch is no more to be depended upon than the same class of Swiss watches. A well-finished and well-cased silver lever cannot be sold at present under *8*l.* to 10*l.**

"I may here at once say that I saw nothing new (in our trade) of any importance, or likely to effect any radical change in watch-making in the Exhibition."

These opinions were written by a London journeyman watchmaker, who was selected as the type of the superior intelligence of his class, and sent over to report specially upon the products of his own trade. It is no use, therefore, in hiding our heads, ostrich-like, in the sands of our own conceit, for that will not alter the hard, irremovable facts that have been long coming, and have at length come upon us. From what we have seen of these American machine-made watches, we have been reluctantly forced to the conclusion, however grievous it may seem to us, that the days of watchmaking by mere hand labour, *are as surely numbered* as were those of the Lancashire hand-loom, after its resistless steam rival had developed its omnipotence.

Let us, however, go further; from the workman to his superior, the scientific horologist, and hear the last-named upon this question.

Sir Edmund Beckett (late Mr. Beckett Denison), one of our most eminent authorities, says, in speaking of the American system, in his "Clocks, Watches, and Bells"—"There are accounts of some of these factories, where watches are made by machinery, so that every piece will fit every watch of the same pattern; on the same principle as Hobbs' locks. *There can be no doubt in the mind of any one who understands machinery, that this is the best, as well as the cheapest, way of making machines which require precision and uniformity.*"

The importance of the words which we have put in italics cannot be too much dwelt upon.

Again, "I can give no description of the American machinery here, but its elements are—stamping plates, and the holes in them, and the wheels, and then cutting the teeth of many wheels together. Although labour is dearer in America than here, this machinery enables them to undersell English watches of the same quality. * * * and if our English makers do not bestir themselves, they will lose the trade," &c.

In selecting a movement to work upon, the Waltham directors settled upon the going-barrel lever, and, furthermore, to employ machinery wherever such employment was of practical value. A visitor to the works tells us that "machinery is employed whenever possible, for the rolling of plates of brass, steel, silver; drawing wires for pinions, pins and screws, punching, swaging, cutting, polishing, burnishing, drilling. Jewels and jewel-holes are almost the only work not done by machinery."

In the rejection of the fusee the managers of the works had to take two important items into consideration; these were the reduction of cost and the breaking of fusee-chains. Our American cousins being credited with much more active locomotary habits than ourselves, the breaking of chains—at least such chains as the great bulk of their imported watches were supplied with—was an annoyance, and one which it was highly desirable should be eliminated from what was to be sent forth as the future standard watch of America. They are as well aware on the other side of the Atlantic—are those cousins, and erstwhile customers of ours—as we are, that the hundreds of pieces of which the fusee-chain is composed present so many hundreds of chances of breakage every wind up. Indeed, upon this very point the writer of this article has a confirmatory word to say. We have lately been visited by a gentleman who has spent the past winter and spring in travelling through the eastern and north-eastern parts of Europe, but chiefly in Turkey and Egypt. In the course of conversation we casually drifted into horological matters. He said that, when camping up the Nile with his party of native servants, he dreaded nothing so much as winding up his watch in the morning before starting, lest he should break the chain; and that nothing should induce him to go through the same ordeal again. He mostly carried two watches with him when travelling, in case of an accident; on the occasion under notice, however, as ill fortune usually manages these things, he left his best instrument behind, through the forgetfulness induced by the hurry of departure. Luckily he escaped misadventure. A dead timekeeper away under canvas in the land of the Pharaohs would be no joke.

In fixing, therefore, upon the going-barrel the American company were mainly influenced by mechanical and economical considerations. Persons, either when travelling or living away from the places where chains could be mended, would eagerly adopt a system that guaranteed them both good time and freedom from chain-breaking. The fusee was, accordingly, passed on backwards to the same category as the verge movement of our forefathers. Speaking upon going-barrels, Sir Edmund Beckett says, "But it is obvious that, as the force of the spring is greater when it is tightly wound up than when it is loose, the force of the train will be very far from constant throughout the day, although that may not affect the going of the watch from one day to another. On the other hand, there is found to be a very singular exception to that rule of Dr. Hooke's, stated just now, inasmuch as there is a position of the spring coiled in a barrel in this way, in which there is no material variation of its force for a few turns. And certainly some of the foreign watches made in this way go very well."

The rule of Dr. Hooke is that one known to every watchmaker; namely, that the force of a spring varies as the degree of tension. In Dr. Hooke's time—1635 to 1702—every maxim devised or applied by an educated man was put into Latin, hence the above one is always written: "*Ut tensio sic vis*." He is described as a short, thin, crooked man, very weak-looking, but very wiry; yet, notwithstanding his apparently delicate formation, he lived sixty-seven years, seldom going to bed until the small hours had well set in, and killed himself at last by exhaustion in the pursuit of science. He is buried in the church of St. Helen, Bishopsgate-street. All watchmakers honour his distinguished memory, as the man who, notwithstanding the dispute with Huggens, invented the spring-balance for watches. But, to return to the principle of the going-barrel, upon the authority previously quoted—

"Even if a watch does go rather faster at one time than another (which it is not certain that such watches do), it is of no consequence, provided they go uniformly from day to day; and there has been strong testimony published in the *Horological Journal* that they do, when well-made, of course. I have seen watches with tapered mainsprings (though the foreign ones are not tapered), which you could not perceive any difference in the force, by the usual testing apparatus of a weighted lever, whether the spring was wholly wound up or not. And, if this is so, the addition of any more machinery, being superfluous, is mischievous, and only in-

creases the expense and size of the watch and risk of the chain breaking, perhaps the most common of all accidents. There is evidently a tendency in watchmaking now to dispense with such machinery, except for marine chronometers, which are required to go uniformly at all times of day, and not merely from day to day. Accordingly, both in Switzerland and America, which are gradually stealing away our common watch trade, as well as that in many kinds of clocks, the fusee and chain (which I will describe presently) are almost universally omitted. * * *

"But in that case there is another risk of breaking, for when the spring breaks the barrel recoils violently from the sudden removal of the pressure, and often breaks some teeth of the great wheel fixed upon it." Just so. And sometimes splits the jewels and fractures the balance-staff into the bargain.

The defects and danger mentioned by the author quoted are provided for in the new watches in this way: firstly, with respect to the alleged want of uniformity of going-barrel time throughout the day.

The mainspring of the Waltham watch is unusually long; one that we tried, belonging to a London No. 16 size, measured 22 inches. When wound up, this spring takes about eight full turns—a number which, of course, makes the upper turns very even in the pull. To run the watch the usual twenty-four or twenty-six hours, only three and a half of these turns are uncoiled. The result of this length of mainspring is, that the resilience of it is practically a "constant," the meaning of which every maker knows; and before that "constant" is disturbed by the opening out of the lower coils in the barrel, it is time to wind the watch up again for the new day's action. Nothing of the kind can, certainly, be more beautiful to the eye, or more delicately respondent to the touch than these springs. We are assured that the greatest care and scrutiny are exercised in their manufacture, selection and adjustment, and that the same supervision is bestowed upon the one at the other end of the machine.

The late Mr. Charles Frodsham was not only a practical watchmaker, but a scientific horologist and experimenter. In his "*Elements of Clock and Watchmaking*," he tells us that "the true seat of the time-keeping principle in every watch or chronometer resides in the union of a perfectly hardened and tempered balance-spring and a perfect compensation balance, the weight and diameter of the balance being in just proportion to the motive force." We have been again assured that those two important conditions, joined to the specially resilient character of the spring, govern the whole of the manufacture of the watches at Waltham.

With respect to the breaking of the mainspring which has been already mentioned, that is provided for in this way. Upon the upper pivot of the arbor of the centre wheel is what is called "Fogg's Patent Safety Pinion." The arbor is tapped with a triple left-hand thread, and upon this thread the pinion screws. This pinion does the usual pinion work, being toothed into the great wheel on the barrel. The action of the wheel upon it is in the tightening direction of the screw; when then the mainspring flies, the recoil of the great wheel whips the safety pinion off the arbor and thus instantaneously releases the whole of the movement.

The special value of the interchangeable system is this. A stock of all the parts of a movement is kept in hand, even to jewels and screws, and duly classified and registered in their several sizes. Should, therefore, any wearer of one of these watches have anything happen to it, from the splitting of a jewel to the breaking of a mainspring, he has only to send the number of his watch to the agent at London, New York, Chicago, Boston, or wherever an agent may be either in Europe, or America, and the return post will convey to him an exact duplicate of the broken article, which he can have fitted in any part of the world where the most humble watchmaker can be found. He need not even send the "bits," but simply the number of his watch. That, it must be admitted, is a great stride onwards to that of having to send the watch entire.

The company employs 1000 persons, including some of the most inventive mechanical minds in America; and there is a trained staff of assistants, presided over by Mr. E. ROBBINS, the company's treasurer.

In the year 1874 the works turned out 100,000 silver watches and 10,000 gold ones, every one of which were sold almost as rapidly as they were made. We have not the slightest conception here of watchmaking on the scale of this stupendous magnitude, that reduces the cost of production between 30 and 40 per cent.

MESSRS. ROBBINS & APPLETON have established the European and Colonial Agency in London, and already their watches are keeping time in Hindostan, China, Australasia, and New Zealand, and few places are becoming better known to the English-speaking watch trade than WALTHAM BUILDINGS, HOLBORN CIRCUS.

THE INVENTION OF TELESCOPES.

(Continued from page 8.)

IT is not improbable that different persons about Middleburg hit upon the invention in different modes about the same time. Lippersheim seems to have made his first rude telescope by adjusting two glasses on a board and supporting them on brass circles. Other workmen, particularly Metius and Gansen, in emulation of each other, seem to have made use of that discovery, and by the new form they gave it, made all the honour of it their own. One of them considering the effects of light as injurious to distinctness, placed the glasses in a tube blackened within. The other still more cautious, placed the same glasses within tubes, capable of sliding one in the other, both to vary the prospects, by lengthening the instrument according to the pleasure of the observer, and to render it portable and commodious. Thus it is probable that different persons had a share in the invention, and jointly contributed to its improvement. At any rate it is undoubtedly to the Dutch that we owe the original invention. The first telescope made by Gansen did not exceed 15 or 16 inches in length, and therefore its magnifying power could not have been very great.

The famous Galileo has frequently been supposed to have been the inventor of the telescope, but he acknowledged that he had not the honour of being the original inventor, having first learned from a German that such an instrument had already been made, although from his own account it appears that he had actually re-invented this instrument; the following is the account in his own words of the circumstances, which led him to construct a telescope. "Nearly ten months ago (namely in April or May, 1609), it was reported that a certain Dutchman had made a perspective through which many distant objects appeared distinct as if they were near. Several effects of this wonderful instrument were reported, which some believed and others denied; but, having it confirmed to me a few days after by a letter from the noble John Badoverie, at Paris, I applied myself to consider the reason of it, and by what means I might contrive a similar instrument, which I afterwards attained to by the doctrine of refractions. And first I prepared a leaden tube, to whose extremities I fitted two spectacle glasses, both of them plain on one side, and on the other side one of them was spherically convex, and the other concave. Then applying my eye to the concave I saw objects appear pretty large and pretty near me, they appeared three times nearer and nine times larger in surface than to the naked eye; and soon after I made another, which represented objects about sixty times larger, and eight times nearer; and at last having spared no labour or expense, I made an instrument so excellent as to show things almost a thousand times larger, and above thirty times nearer than to the naked eye. In another part of his writings, Galileo informs us that he was at Venice when he heard of Prince Maurice's instrument, but nothing of its construction; that the first night after he returned to Padua he solved the problem, and made his instrument the next day, and soon after presented it to the Doge at Venice, who, to do him honour for his grand invention, gave him the Ducal letters which settled him for life in his lectureship at Padua; and the republic, on the 25th of August in the same year (1610), more than tripled his salary as professor.

The following is the account which this philosopher gives of the process of reasoning which led him to the construction of a telescope—"I argued in the following manner: the contrivance consists either of one glass or more; one is not sufficient, since it must be either convex, concave, or plane; the last does not produce any sensible alteration in objects; the concave diminishes them; it is true that the convex magnifies, but it renders them confused and indistinct, consequently one glass is insufficient to produce the desired effect. Proceeding to consider two glasses, and bearing in mind that the plane glass causes no change, I determined that the instrument could not consist of the combination of a plane glass with either of the other two. I therefore applied myself to make experiments on combinations of the two other kinds, and thus obtained that of which I was in search." If the true inventor is the person who makes the discovery by reasoning and reflecting, by tracing facts and principles to their consequences, and by applying his invention to important purposes, then Galileo may be considered as the real inventor of this telescope. No sooner had he constructed this instrument (before he had seen any similar one) than he directed his tube to the celestial regions, and his unwearied diligence and ardour were soon rewarded by a series of new and splendid discoveries. He described the four satellites of Jupiter, and marked the periods of their revolutions; he discovered the phases

of Venus, and thus was enabled to adduce a new proof of the Copernican system, and to remove an objection that had been brought against it. He traced on the lunar orb a resemblance to the structure of the earth, and plainly perceived the outlines of mountains and vales, casting their shadows over different parts of its surface. He observed that when Mars was in quadrature, his figure varied slightly from a perfect circle, and that Saturn consisted of a triple body, having a small globe on each side, which deception was owing to the imperfect power of his telescope, which was insufficient to show him that the phenomenon was in reality a ring. In viewing the sun he discovered large dark spots on the surface of that luminary, by which he ascertained that that mighty orb performed a revolution round its axis. He brought to view multitudes of stars imperceptible to the naked eye, and ascertained that those nebulous appearances in the heavens which constitute the Milky Way consist of a vast collection of minute stars, too closely compacted together to produce an impression on one unassisted vision.

(To be continued.)

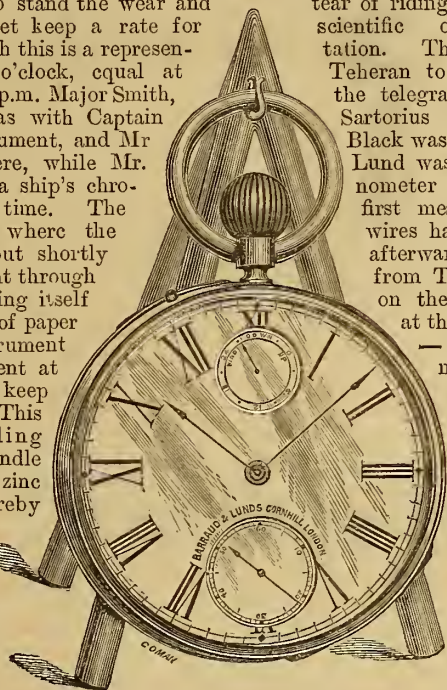
THE SILVER TRADE PENSION SOCIETY.

THE seventeenth anniversary dinner of this society was held on Tuesday, 15th ult., at the London Tavern. In the absence of the Lord Mayor (who was announced to occupy the chair), Mr. Alderman and Sheriff Ellis presided, and was supported by nearly seventy of the friends of the society. As on all occasions of this kind, the heads of our constitution had homage paid them, the company evidently approving the apt reference of the chairman to the action the Prince of Wales was taking with regard to the promotion of the musical skill of the country. The chairman submitted that they had reason to be proud of, and grateful for, the services given to the country by the army and the navy, and he then proposed the healths of those who were associated with our military organization, including the volunteers. For the army and navy, Mr. Davis responded, while Lieutenant Lambert acknowledged the toast on behalf of the auxiliary forces, saying that the volunteers were much indebted to the City for encouraging them by offering prizes for shooting. Before giving the next toast the chairman explained that the absence of the Lord Mayor was unavoidable. When his lordship promised Mr. Holland (the honorary secretary) to attend he had an earnest desire to do so. What he (the chairman) now proposed to them was, "Success to the society," which was founded to relieve the old or afflicted of the silver trade, as well as their widows. In supporting the society they would do a charitable act, and induce the workman to put forward his best efforts in the interests of his trade. He gave a few statistics bearing upon the society, which, he said, was founded in 1836. Since its foundation, 117 pensioners (65 males and 52 females), had been elected. There were now 12 males and 33 females on the list. The funds of the society had increased much, but there was no reason why they should not be still further multiplied. Instead of the possession of 900*l.* per annum, they might have 2000*l.* or 3000*l.* He concluded by commending the charity as one which had strong claims upon their benevolent support. Mr. George Adams proposed "The health of the chairman," thanking that gentleman for his able advocacy of the claims of the charity. The toast was responded to, and the chairman, in doing so, pointed to the association of the corporation with the benevolent attitude of the country. He hoped, therefore, that they would always find a citizen ready to respond to the call to preside on occasions like these. Mr. B. Garrett proposed "Prosperity to the corporation," which, he maintained, had justly acquired a high reputation throughout the country. Mr. Under-Sheriff Sedgwick responded. He submitted that the corporation would, if occasion impelled it, be found to be a formidable bulwark, not only against attacks upon its privileges, but, if necessary, as in former times, the liberties of the people. Mr. Holland, C.C., gave "The health of the president" (Mr. Adams), who took an active interest in the welfare of the society. The toast was answered, and then the chairman proposed "The healths of the trustees" (Mr. Holland, Mr. S. Smith, Mr. G. Lambert, and Mr. John Mansfield). This was replied to by Mr. Lambert. "The committee, auditors, and shop collectors," proposed by Mr. Feron, was answered by Mr. N. Esterbrooke. "The visitors," given by Mr. J. Aldwinckle, was acknowledged by Mr. J. Taylor. The secretary (Mr. Manton) announced that the subscriptions amounted to about 180*l.* The selection of music was by Madame Ashton, Madame Manton, Mr. T. W. Simons, and Mr. Theodore Distin; Mr. F. H. Cozens being at the piano.

INTERESTING SCIENTIFIC EXPERIMENT.

RATING CHRONOMETERS BY TELEGRAPHY.

A VERY interesting, as well as remarkable experiment, which is probably unique in the history of telegraphy, was conducted a few weeks since by Mr. John A. Lund (of Messrs. Barraud & Lunds, Cornhill), at the offices of the Indo-European Telegraph Company, and in which instance, question and answer travelled over a distance of 1,620,000 miles nearly as quickly as they were spoken. The cause of this experiment (which necessitated the closing for a time of all intervening stations between Teheran and London, a distance of 3700 miles) was a desire expressed by Captain Sartorius, brother to the captain of Ashantee celebrity, and who is now at Teheran, Persia, to check with absolute correctness the variation between a chronometer watch in use for surveying purposes, and supplied by this firm, and the true Greenwich time here. The instrument alluded to is not a full-chronometer, but a half-chronometer, double roller lever, pocket watch, of a kind which Messrs. Barraud & Lunds, find able to stand the wear and use, and yet keep a rate for and of which this is a representation. The time here was eight o'clock, equal at past eleven p.m. Major Smith, tendent, was with Captain heran instrument, and Mr the one here, while Mr. ance with a ship's chro- Greenwich time. The at Berlin, where the eoupled; but shortly sage was sent through was uncoiling itself like a piece of paper street instrument signal current at eight, and keep twenty." This by holding small handle neets the zinc wires, thereby electric the space minute Mr. Lund "fifty- "fifty- "sixty," seconds which the minute. At the word "sixty" the handle was loosed, and Captain Sartorius would the same instant know that it was 8.20 p.m. Greenwich time. To check the minute differences of individual observations the experiment was repeated two or three times, the result being that Captain Sartorius's watch was shown to be about two seconds behind Greenwich time. It was necessary to take several observations, as there was something wrong with the German "relays" a time or two. The delay is a connexion with fresh batteries, which feed the wire at intervals, because if the wire were charged with a current sufficiently strong to go the whole distance it would soon be worn out, or, in technical language, lose its conductivity. On the other hand, a single weak current would diffuse itself before reaching the end of so long a journey. While the current was flowing its duration was marked by a long black line on the paper at Teheran, and when it stopped there would be a sharp "click," as the pressure in the London handle was removed. Perhaps the most marvellous fact about the whole thing is, that (as is well known to telegraphists) the "earth current," or stream of electricity which completes the circuit from battery to battery, finds its way through the earth from Teheran to London without any wire or other connection whatever till it finds the battery from which it started, and this, too, instantaneously. When the experiment itself was concluded, there were a few friendly inquiries by Mr. Lund about the chronometer which Captain Sartorius took with him. "How was it going?" "Oh, very well, thank you; it was a second slow at Constantinople," comes back the answer, as if only across a shop counter. "Glad to hear it." "Much obliged for the trouble you've taken in London." "Very welcome." "Good night!" Such exactitude of time is, of course, only absolutely necessary in scientific investigations, but in these, as in the late transit of Venus, it is of great importance to know what the true time is. Messrs. Barraud and Lunds appear to pay special attention



to this department, as their Cornhill establishment is fitted in every room with the most ingenious contrivances for registering Greenwich time. In one of them, which is especially worth notice, an electric shock leaves a mark from a hand charged with ink on the face of a chronograph, thus getting rid of even the infinitesimal error arising from observation by the eye or ear in the ordinary methods.

BAILEY'S TURRET CLOCK.

ON the following two pages will be found engravings of one of the large turret clocks manufactured by the well-known firm of Bailey & Co., of the Albion Works, Salford, Manchester. It is what is known in workshop parlance as the "lathe-bed" pattern, in contradistinction to those which are called the "cage" pattern, made by our forefathers out of strips of wrought iron bolted together to form a cage, and bushed with brass where requisite. There are points of superiority about this clock to which we think profitable attention may be directed by those engaged in mechanical pursuits. The adjusting of the external dials by means of the internal minute dial is very simple. The old-fashioned way to do this was to have a long bearing on the pallet shaft to enable the pallet wheel to be disengaged, and thus to "run down" the clock until the right time was indicated outside. If this was done in a clumsy manner, very often the teeth were damaged, and sometimes entirely stripped by allowing the pallet to slip into gear when the wheel was revolving at a great speed. Messrs. Bailey effect the operation in a totally different way. Fig. 1 is plan of hour shaft with a friction clutch lock-nut and set dial, Fig. 2 is the friction clutch, and Fig. 3 is elevation of dial and bevel, and on reference to the large engraving it will be seen with what ease the upright shaft which leads to the dials may be adjusted by this simple arrangement. The pendulum has appeared in many shapes in the hands of horologists; many of the means of compensating for the effects of temperature on their length seem to be ingeniously contrived to create a great evil in order that a little one may be cured. The most approved system of compensation is the mercurial. A steel rod carrying a glass jar containing mercury, the expansion of the mercury upwards will compensate for the lengthening of the steel rod downwards, and thus keep the centre of oscillation at one fixed distance from the point of suspension. The compensation is only applicable to small clocks. If a wood pendulum rod be used, well dried and varnished, its expansion is very trifling, and very little compensation is required. Figs. 4 and 5 show the front and side elevation of the wood pendulums used in the large clocks made by Messrs. Bailey & Co. At the bottom of the rod, at Fig. 4, is a cotter pin, upon which rests a brass rod standing up the centre, about 12 inches long; the bob rests on this rod, a cotter pin driven through its centre causing all the weight to rest on the upright brass rod; the expansion of the rod of wood and the suspension springs is compensated by the expansion of the small brass rod. The way in which these large pendulums are adjusted will be seen and understood by reference to the upper ends of Figs. 4 and 5. A brass nut is let into the rod through which works a bolt having a milled head resting on the crutch. This crutch is so arranged that the pendulum slides between its two jaws. This simple manner of adjustment at the top of the pendulum is an obvious improvement on the plan of adjustment used at the bottom, as it enables a slight adjustment to be made without stopping the clock. The horizontal adjustment for the springs at the top of the pendulum has been copied from the small French clocks. This enables the clock to be put in beat if a slight variation takes place after it has been fixed.

When winding the heavy weights of the striking parts of large clocks the winch handle cannot be used direct on the drum shaft; a pinion wheel being added to the wheel similar to the arrangement of a hoisting crab; Fig. 7 shows a plan adopted by Messrs. Bailey for using the first pinion of the train for this purpose. It will be observed that the pinion works loose from the second wheel when required for winch purposes, the ratchet wheel and clicks enabling this to be done, but when required for the clock purposes it is equal to a fast pinion wheel, and thus does duty for both. This improvement is so obvious that no comment is required. Although the clock here illustrated has been designed by Mr. W. H. Bailey, it is only doing justice to the late Richard Roberts, of Manchester, to say that the specific improvements mentioned have been very slightly altered from his designs, with the exception of the framework. The wheels in this clock are of hard gun metal, engine cut, and the pinions are of hardened steel. The drums have a worm cut on them to enable the wire rope to coil freely. A number of these clocks are being fixed at home and abroad by Messrs. Bailey & Co., one of a larger size, and to strike the quarters, having during the past few days been fixed at Walkden Church, near Manchester, having been presented by Mr. William Crompton, ex-mayor of Wigan, an extensive iron and coal proprietor.—*Engineer.*

IMPROVED TURRET CLOCK.

CONSTRUCTED BY MESSRS. BAILEY & CO., ALBION WORKS, SALFORD.

(For description see page 31.)

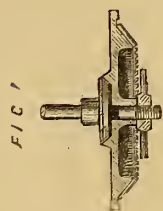


FIG 6

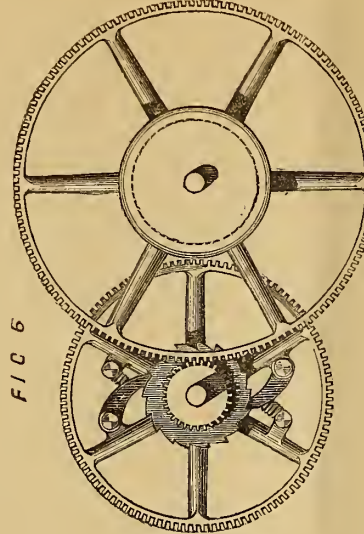


FIG 2



FIG 4



FIG 5

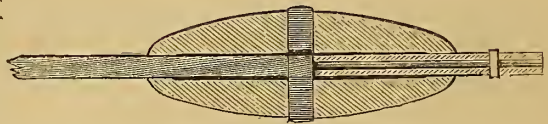
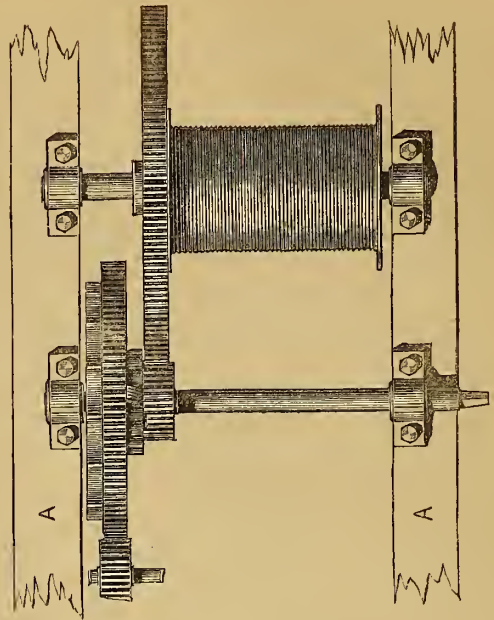


FIG 3



FIG 7



SCALE OF INCHES
0 1 2 3 4 5 6 7 8 9 10 11 12

PRECIOUS STONES.

GENERAL OBSERVATIONS (*continued from page 4.*)

Hardness—In gems, hardness denotes not only tenacity, but also the greater or less resistance which they oppose to being cut, scratched, or polished by others; thus, while the diamond, from its small tenacity, is easily broken, and does not give out sparks under the action of the steel, it is the hardest amongst gems, because it cuts all other bodies without being itself marked by them.

The hardness of gems, considered as the attraction of cohesion, that is, in the power they have of resisting the blows they receive to break and divide them, mechanically differs considerably in the same species, according to the direction of the cutting, the surface of the stone on which the trial is made, and its more or less perfect quality.

Hardness and not cohesion is the basis on which general experience rests for determining to what species a given gem belongs. For such a purpose practitioners adopt the file; but the mineralogist rubs the stone which is to be tried against another, beginning with the hardest gem, which is the diamond, and thus forms, by comparison, a graduated table, which is useful afterwards for new trials and experiments.

In many crystals perpendicular planes at right angles exist, and it appears that between these planes the cohesion is so slight that they can be separated with greater facility there than in any other place. This particular property is called "cleavage." In some gems it is very easy to ascertain the point of cleavage, but in others it is found with difficulty. Many gems, as for example, rock-crystal and emerald, will only break into irregular fragments.

Specific Gravity.—In order to determine the specific gravity of different bodies, distilled water is chosen as a means of comparison.

If it be a gem which weighs 17 carats in the air, and in the water but 12, there will be

Weighted in the air	...	...	17 carats.
Weighted in the water	...	...	12 "
Difference	...	...	5

Now dividing the weight of the gem 17 by the difference 5, the quotient will be $17 : 5 = 3.4$ which represents the specific gravity of the gem which has been put to the proof. It is often very useful to know the specific gravity of gems, as a means of determining their quality, and to prevent the danger of their being changed for others, similar in appearance, but very different in value; as for instance the diamond and the jargoon.

In the case of cut and polished gems, it is therefore of great use in ascertaining the class to which they belong, without the possibility of injuring them by the otherwise necessary operation of filing.

The comparison of the specific weight of gems was, according to Emmanuel, known to and practised by the Ancients, and certainly in the Indies for many centuries, in order to ascertain the quality of a precious stone.

(*To be continued.*)

THE DIAMOND.

(*Continued from page 4.*)

THERE are said to be five different kinds of diamonds, viz., the Indian, the Arabian, the Cyprian, the Macedonian, and the Sidente. The two first described by Pliny are really diamonds; but the others are white corundums, that is, very pale sapphires, especially the Cyprian, denoted thus: *Vergens in aereum colorem*.

The most probable opinion respecting the place whence the ancients obtained the diamond is, that it was India; but the question remains yet—what was the particularly adamantiferous part of that country?

We only know that the Greeks named the central river of India, Adamas, which is now called Mahy-nady. In Pliny, we find the African diamond of Gournel mentioned, and this river flows near Constantina.

The mines and adamantine deposits of Visapour were discovered in 1430, and those of Golconda in 1662. Afterwards others were found in Borneo, in Sumatra, in the Celebes, in the gold mines of Antioquia in Brazil, Columbia, Carthage, and California. In modern times the villages of Mannsburg and of Muddemurg in Asia, are celebrated as being places where the largest known diamonds are found.

At Latarivai, also in Asia, the largest and finest are procured; and those of more usual size at Gani, Malacca, Bisnagur, Gazerpelle,

Gouart, Pegro, and other places situated near Mont Catti, an immense chain of granite which extends from Bengal to Cape Cormorin.

In the last century, the most important mines were those of Partial, situated about twenty miles from Golconda. Diamonds are also found in the river Gomel, which empties itself into the Ganges; in Krichwak, and in many other places.

Now, as formerly, the principal market for these precious gems is held at Benares, and at Borvanipord, in the province of Bengal.

In the territories of the city of Pontianak and of Benjerussassin, situated in the south-eastern part of the island of Borneo, and in the Crystalline mountains of the north of that island, very rich mines of diamonds are found; the most famous of them being situated near Landak, one of the principal cities. The largest are sent to Batavia, whence they go directly to Holland. The smallest are sold at Pontianak. At Murtaepsera, the ancient residence of the Sultan, the inhabitants themselves search for diamonds in the surrounding mines. About the year 1840, diamond deposits were discovered in the district of Douladoulou in Sumatra. In the Malays the island of Celebes has some, but there are very few at Gava. The Chinese have so few diamonds that one can scarcely believe they possess any mines. The signs of rank, and the precious decorations of which the celestial emperor, the imperial princes, and mandarins make such parade, are in pearls, rubies, emeralds, sapphires, jade and coral, but diamonds are never seen.

In Siberia diamonds have been found in strata of ferruginous clay on Mount Ural; and this discovery has destroyed the formerly received opinion concerning the formation of this gem.

Pliny had noticed the river Gournel near Constantina as being adamantiferous, and Herscart de Thury, in 1840, confirmed the truth of this opinion by presenting to the Institute of France some diamonds procured there by himself.

About the year 1729, Bernardo di Fonseca Lobo discovered very rich diamond lands sixteen leagues long, and twelve leagues wide, at Brazil, in the province of Minas Geraes, a district of Serva da Frio.

The central point of the mines here opened is the little city of Tejuco (Dramantusa), situated 134 leagues from Rio de Janeiro, and 240 from Balisa. It is the residence of the general intendant, and contains upwards of 6000 inhabitants, all employed in excavating the mines, which at the beginning yielded abundantly; the first twenty years it is calculated that about 3,000,000 carats of rough diamonds were dug out, but the product did not continue in the same proportion, it diminished gradually; in the five years from 1801 to 1806 they only yielded 23,135 carats; and in the ten years from 1807 to 1817, but 18,000. Other mines were discovered in 1831 not far from these, on a very high mountain of the same province. There are also mines at Tibbigi near San Paulo in the province of Goyaz; in the plains of Cubaja; in the river of Audaya; in that of Mal Koverde, and also in Brazil.

(*To be continued.*)

ROYAL ASTRONOMICAL SOCIETY.

THE last meeting before the long vacation was held at the Society's Rooms, Burlington-street, on the 11th ult., Professor ADAMS, president, in the chair.

Mr. Jecky explained the use of two ancient instruments, which he had presented to the society. Mr. Marth exhibited a drawing of the orbits of the satellites of Saturn, as they would appear from the earth about the middle of August next. Mr. Dunkin read a paper by Mr. Proctor on "Photography of the Transit of Venus." Mr. Nelson read a paper on an instrument for measuring the magnitude of the stars. The meeting then terminated.

ROYAL MICROSCOPICAL SOCIETY.

THE usual monthly meeting of this society was held on the 2nd ult., CHAS. BROOKE, Esq., F.R.S., vice-president, in the chair.

A number of presents to the society were announced and acknowledged. Mr. J. W. Stephenson exhibited and explained a simple method for enabling any person to measure the angle of aperture of an objective. Mr. Charles Stewart gave an interesting account of the results of an examination into the minute structure of the *Bucephalus polymorphus*, and illustrated his observations by drawings and enlargements therefrom upon the black-board. Mr. Slack explained the use and management of Mr. Wenham's reflex illuminator, and pointed out the means of obviating the difficulties which were found to arise when it was used in connection with objectives of large angles, after which the meeting was adjourned to October 6th.

THE

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A MONTHLY TRADE JOURNAL.

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades,

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The services of an energetic and reliable person are required for the advertising department of this journal. Applications to be made by letter only, to the Publisher, 8, Cross Street, Hatton Garden, E.C.

The attention of our readers, and the trade generally, is called to the form of subscription order, which will be found on page 19. When two or more copies are forwarded to one address, or in instances of subscription clubs being formed so that the copies for such club are sent to one person, a discount of 10 per cent. will be allowed from the regular subscription rates, but in no instance will such deduction be made for subscriptions of less than one year.

PROSPECTUS.

IN the present days of commercial activity no branch of industry can be without its leading representative journal, and experience shows that the time has now arrived when the various trades, to the interest of which our labours are directed, require a medium equal to others representing different commercial pursuits, and, with the view of possessing which, they should secure to themselves a properly recognized organ wholly devoted to their own peculiar interests.

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WATCHMAKER, JEWELLER, AND SILVERSMITH'S
TRADE JOURNAL,

of which this is the second number. As such undertaking must necessarily entail considerable anxiety and labour to establish it on a firm basis, so as to become of real benefit to the trades it will represent, we respectfully solicit the kind co-operation and support of every one whom it may concern, whilst the following outline will give a fair idea of its aim and general usefulness. Each number contains leading articles, penned by men of practical experience, upon subjects of particular interest to Watch and Clock Makers, Jewellers, Gold and Silversmiths, Electro-platers, Opticians, Assayers, and all the other allied branches of these important trades; also, illustrated articles upon the Novelties, Patents, and noteworthy Specialities, both British and Foreign, a brief Monthly Record of Passing Events, Trade Changes, interesting items of Gossip, important Legal and Arbitration Proceedings, the result of Public and other Sales, original contributions upon Art, Applied Science, the Labour Question, Letters from our Own Correspondents in the Provinces, Foreign and Colonial Notes, Practical Hints, Notes and Queries, and a variety of other useful and interesting subjects.

From this brief sketch it will be seen that such a journal can hardly fail to prove of considerable benefit to its supporters, as it presents an opportunity for free interchange of ideas and suggestions on questions affecting the interests of the trades, and at the same time keeps its readers fully and regularly posted as to what is going on, besides affording manufacturers and wholesale houses valuable assistance in their business transactions with exporters, agents, and the retail trades.

In concluding these remarks, we especially wish to point out to manufacturers and wholesale houses the great advantage of inserting their trade announcements in the advertising columns of such a journal, and we respectfully direct their attention to the enclosed order-forms, in the hope that they will communicate their wishes as early as possible to the publisher, who will be pleased to afford them every information, as well as offer them the benefit of his experience and assistance in drawing up or arranging their notices.

Continuing our untiring endeavours to please, we shall at all times deem it a favour if our readers or friends will forward us any suitable contributions likely to prove of general interest, or make suggestions, which will be received with thanks and due attention.

All communications to be addressed—

Proprietors of the

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8, Cross Street, Hatton Garden, E.C.

CURIOSITIES OF CLOCKS AND WATCHES.

THE identical watch that Quare made for James II., and that was preferred by him, was in possession of John Stanton, of Benwell, near Newcastle-upon-Tyne, when, in a letter to the *Morning Chronicle*, dated December 11, 1823, he gave the following description of it:—"The outer case, which is of very pure gold, is embossed with the king's head, under which, on the right, is Fame in the clouds, with a trumpet at her mouth, which is held in her left hand; in her right is a wreath, which she is raising as if to crown him; on the left are two winged boys supporting the royal crown, under them a tower and fortifications, on which is a flag flying; under all is the sea running close to a fort, and on the sea is a ship under sail. This case is also beautifully engraved and pierced with scroll-work, ornamented with cannon, mortars, shot, shell, kettle-drums, colours, and other trophies of war, and with crowns, sceptres, and other emblems of royalty. The face is of gold, with black Roman letters for the hours and figures for the minutes. In the centre is a piece of pierced work in gold upon blue steel, representing the letters 'J. R. R. J.,' combined so as to appear like an ornamental scroll, above which is the royal crown. The box is exquisitely pierced with scroll-work, intermixed with birds and flowers; about the hinge is engraved a landscape, with a shepherd sitting under a tree playing upon a pipe, with a dog at his feet, and houses, trees, &c., in the distance. On the back of the box two circular lines are drawn, between which is the following inscription:—"James II. *Gloria Deo in excelsis sine pretio rectimi mini malâ lege ablatum brio. Regi restituitur.*" Inside the circle described within the inner line is engraved a figure of Justice in the clouds, reclining upon the left elbow, the hand holding the scales; in her right hand is a sceptre, with which she points to three bishops beneath her, with an altar before them. On one side of the altar is the Tower of London, with a group of twenty-nine men carrying similar bags, of which there are several more lying in the foreground; under all a lion and a lamb are lying together. The watch is considerably thicker than, but otherwise not much above, the common size, and every part of the engraving beautiful and distinct. It goes accurately, and is in a perfect state of preservation."

A patent was granted to Daniel Quare, on August 2, 1695, for the invention of a portable weather-glass or barometer. He was much respected by the trade to which he belonged. At his funeral, on March 20, 1724, most of the watchmakers of London were present. He was interred in the Quaker's burying-ground, at Bunhill Fields. Several artists followed in the same line as himself, particularly Tompion, Julien le Roy, Collier, Larca, and Thiout.

Quare's rival, Edward Barlow, whose real name was Booth, was born near Warrington, and ordained in the English College, at Lisbon. He took the name of Barlow from his godfather, Ambrose Barlow, a Benedictine, who suffered at Lancaster for his religion. Dodd, in his Church history, says of Barlow, "He has often told me that at his first perusing of Euclid that author was as easy to him as a newspaper. His name and fame are perpetuated for being the inventor of the pendulum watches, but, according to the usual fate of most projectors, while others were great gainers by his ingenuity, Mr. Barlow had never been considered on that occasion, had not Mr. Thompson (accidentally becoming acquainted with the inventor's name) made him a present of 200*l*. He published a treatise on the "Origin of Springs, Wind, and the Flux and Reflux of the Sea," 8vo, 1714, and died about two years afterwards, nearly eighty-one years of age.

The Rev. G. S. Wasey has a magnificent gold repeater by Tompion, apparently as good as ever it was, and weighing over 6 oz. Madame Banzalé, of Paris, had a large gold repeating watch set with diamonds, and that chimed the hours. It formerly belonged to the King of Spain. In the South Kensington Museum is a gilt metal repeating watch, chased and pierced, the sides being ornamented with hunting subjects, and the back with scroll-work; the dial is engraved and gilt; the maker's name is "Thomas Taylor, in Holbourn;" the diameter is $2\frac{1}{4}$ in., and the article was purchased at the Bernal sale for 3*l*. 10*s*. In the "Philosophical Transactions" appears an account by Godfrey William de Leibnitz, of his portable watches in 1675. This eminent mathematician and philosopher was born at Leipzig, in 1646, and died in 1716.

To silver the inside of hollow glass vessels, globes, convex mirrors, &c., the following amalgam, which becomes fluid at a low heat and adheres to glass, may be used:—Lead and tin of each 2 oz.; bismuth 2 oz.; mercury 4 oz. Add the mercury to the rest in a melted state and remove from the fire. Mix with an iron rod.

CORRESPONDENCE.

[We wish it to be understood that we cannot necessarily identify ourselves with the opinion of our correspondents, as our columns will be open to all, so long as communications do not contain matter of a personal character.]

* * All letters intended for insertion must be authenticated by the name and address of the writer—not necessarily for publication, but merely as an evidence of good faith. Communications should be written on one side only of the paper, and forwarded to this office on or before the 26th of the month.

PROPOSED MASTER JEWELLER AND SILVERSMITH'S ASSOCIATION FOR BIRMINGHAM.

To the Editor of the "WATCHMAKER, JEWELLER, AND SILVERSMITH."

SIR,—Some of the Birmingham master jewellers and silversmiths are moving in the right direction; they propose establishing an association, the objects of which are to give valuable information to its members as to the trustworthiness of traders in jewellery and silver goods, and to raise a fund to prosecute fraudulent traders. If the association does nothing else than accomplish two such objects, it deserves all the support and encouragement the trade can give it. Of late, jewellers in particular have been preyed upon by unworthy traders, who nominally buy, and actually do not pay for, the goods they have the audacity to select.

Men of straw seem to eclipse men of real substance now-a-days, and by a clever contrivance and systematic fraud obtain great quantities of valuable goods, and then slaughter them wholesale; sometimes paying a small sum in the pound, and sometimes quitting the country, their whereabouts being unknown. Poor jewellers never receive any money at all, and have the satisfaction only of knowing that the vagabonds have, like some monarchs of old, retired from business, and for the rest of their days live in quiet seclusion on the continent, or in the far-off colonies.

The proposed Jeweller and Silversmith's Association, if properly set on foot and adequately supported by the trade, not only in Birmingham but also that of London, much could be done by way of caution, which in many cases would save struggling manufacturers from ruin, or next to ruin. The trade wants purging from a number of reckless, moneyless traders, and the only effectual means of bringing so desirable a thing about is to join together and to unite for means, as necessary as they are positively obvious.

A good association would act as a deterrent to those who prowl about the country seeking whom they may defraud, and would regenerate, in some measure, the jewellery trade from its present state.

Everything depends upon the master jewellers and silversmiths, both in Birmingham and London; and it would be an excellent combination if both would co-operate and form a great trade association.

Yours truly, JEWELLER.

Owing to a heavy pressure of matter, which will all be found of interest to the various trades we represent, the continuation of some articles commenced in our last, and a variety of other subjects are necessarily laid over till our next issue. Thanking the trade in general for the favourable manner in which our journal has been received, we can only give the full assurance that our utmost endeavours will be exerted to merit a continuance of support and approval.

THE Prussian Government has offered two prizes of the value of about 150*l*. and 500*l*. respectively, for a method of cleansing plaster casts, statues, &c., and for the invention of a new material, which, while possessing all the advantages of plaster, will not deteriorate by repeated washing. It is not necessary that the washing material or the new substitute for plaster should be white: it may give a yellowish, or even warmer tint, provided that the colour is even. Samples of the substances, either for mixing with plaster so as to render it washable, or of the substitute for plaster, must be forwarded in the usual way, with mottoes on them and on the accompanying letters, to the K. P. Ministerium der geistlichen Unterrichts und Medicinal-Angelegenheiten, Berlin, not later than December 31, 1875.

THE following alloy of copper will attach itself firmly to surfaces of metal, glass, or porcelain: 20 to 30 parts finely blinded copper (made by reduction of oxide of copper with hydrogen or precipitation, from solution of its sulphate with zinc) are made into paste with oil of vitriol. To this add 70 parts mercury and triturate well; then wash out the acid with boiling water and allow the compound to cool. In ten or twelve hours, it becomes sufficiently hard to receive a brilliant polish, and to scratch the surface of tin or gold.

USEFUL HINTS TO WATCHMAKERS AND JEWELLERS.

ENAMELS.

Fritz or White Flux.

THE basis of all enamels, is a highly transparent and fusible glass called Fritz, Flux, or Paste, which readily receives a colour on the addition of metallic oxides. It may be made by one or other of the following formulæ:—

No. 1. Red lead 16 parts, calcined borax 3 parts, powdered flint-glass 12 parts, powdered flints 4 parts, fuse in a Hessian crucible for 12 hours, then pour it out into water, and reduce it to a powder in a biscuit-ware mortar.

No. 2. Tin 3 parts, lead 10 parts, mix calcine in an iron pot at a dull cherry-red heat, and scrape off the oxide as it forms, observing to obtain it quite free from undecomposed metal; then reduce it to fine powder by grinding and elutriation. In this state it is known among enamellers as Flux or Calcine, 4 parts of this calcine are next mixed with an equal weight of pure sand or powdered flints, and one part of sea salt or other alkaline matter; the mixture is then partially fused in a Hessian crucible, by which it undergoes semi-vitrification.

No. 3. *Chaptal*. Lead and tin equal parts, calcine as above, and take of the mixed oxides or calcine, and ground flints of each, 1 part, pure carbonate of potash 2 parts, and proceed as before.

No. 4. *Wynn*. Flint glass 3 oz., red lead 1 oz., as last.

No. 5. *Wynn*. Red lead 18 parts, borax (not calcined) 11 parts, flint-glass 16 parts, as last.

No. 6. *Wynn*. Powdered flints 10 parts, nitre and white arsenic, of each, 1 part, as last.

The precise qualities of the products of the above processes depend greatly upon the duration and degree of heat employed. By increasing the quantity of sand, glass, or flux, the enamel is rendered more fusible, and the opacity and whiteness is increased by the addition of oxide of tin. The use of borax should be avoided, or it should be used sparingly, as it is apt to make the enamel affloresce and lose colour.

BLACK ENAMEL.

No. 1.—Calcined iron (protoxide) 12 parts; mix and add an equal weight of white flux, and fuse as before.

No. 2. *Clowet*. Pure clay 3 parts, protoxide of iron 1 part. A fine black.

No. 3. Peroxide of manganese 3 parts, zaffre 1 part; mix and add it, as required, to white flux.

BLUE ENAMEL.

No. 1. White frit, or flux, coloured with oxide of cobalt.

No. 2. Sand, red lead, and nitre, of each 10 parts, flint glass, or ground flints, 20 parts, oxide of cobalt 1 part, more or less, depending on the desired depth of colour.

BROWN ENAMEL.

No. 1. Manganese 5 parts, red lead 16 parts, flint powder 8 parts, as before.

No. 2. *Wynn*. Manganese 9 parts, red lead 34 parts, flint powder 16 parts.

No. 3. Red lead and calcined iron, of each 1 part, antimony, litharge, and sand, of each 2 parts. To be added in any required proportion to white frit, according to the colour desired. A little oxide of cobalt, or zaffre, is frequently added to alter the shade.

GREEN ENAMEL.

No. 1. Flux, or frit, 2 lbs., black oxide of copper 1 oz., as before.

No. 2. As the last, but adding red oxide of iron $\frac{1}{2}$ drachm, less decisive.

No. 3. Copper dust and litharge of each 2 oz., nitre 1 oz., sand 4 oz., flux, or frit, according to colour wanted.

No. 4. From transparent frit any quantity, oxide of chormium enough to colour. Colour superb; it will stand a great heat; in common hands, however, it frequently turns on the dead leaf tinge.

No. 5. Transparent flux 5 oz., black oxide of copper 20 to 40 grains, oxide of chromium 2 grains. Resembles the emerald.

No. 6. From blue and yellow enamel in the required proportions.

OLIVE ENAMEL.

Blue enamel 2 parts, black and yellow enamel, of each 1 part. See brown enamel.

ORANGE ENAMEL.

No. 1. Red lead 12 parts, red sulphate of iron and oxide of antimony, of each 1 part, flint powder 3 parts, calcine together, powder and melt with flux 50 parts.

No. 2. *Wynn*. Red lead 12 parts, oxide of antimony 4 parts, flint powder 3 parts, red sulphate of iron 1 part, calcine, then add flux, 5 parts to every 2 parts of this mixture.

PURPLE ENAMEL.

No. 1. Flux, or frit, coloured with oxide of gold, purple precipitate of cassius, or peroxide of manganese.

No. 2. Sulphur, nitre, green vitriol, antimony, and oxide of tin, of each 1 lb., red lead 60 lb., mix, fuse, cool, powder, and add rose copper (red oxide) 19 oz., zaffre 1 oz., crocus martis $1\frac{1}{2}$ oz., borax 3 oz., and of a compound formed of gold, silver, and mercury 1 lb., fuse, stirring the melted mass with a copper rod all the time, then place it in crucibles, and submit them to the action of a reverberatory furnace for twenty-four hours. This is said to be the purple enamel used in the Mosaic pictures in St. Peter's, at Rome.

(To be continued.)

WATCH AND CLOCK MAKING IN SWITZERLAND.

ONE of the largest and most interesting branches of Swiss industry is the watchmaking trade. It is carried on to an immense and still increasing extent in the mountainous districts of Neuchatel, in the French portion of the Canton of Berne, and in the town and neighbourhood of Geneva. It has been a source of wealth and comfort to many thousands of the inhabitants, who, in the seldom-visited villages of the Jura, have gathered around them a large portion of the enjoyments of life. Switzerland has long furnished the largest supply to foreign markets.

The art or trade of clockmaking was introduced into the mountains of Neuchatel in a manner worthy of notice. As early as the seventeenth century some workmen had constructed clocks with weights, but no idea had been conceived of making them with springs. About the end of that century, an inhabitant of the mountains, returning from a long voyage, brought with him a watch, which was an object previously unknown in the country. It was put into the hands of a skilful workman to be repaired, who succeeded in doing so, and then tried to make a similar article. He succeeded in effecting this also, notwithstanding the difficulties which lay in his way, he having to construct the tools with which he wrought, as well as all the different movements of the watch. His success naturally created a great sensation; other workmen were stimulated to try what they could do, and a new branch of industry sprung up in the mountains of Neuchatel. During the first forty or fifty years a few workmen only were employed in watchmaking; and owing to the numberless difficulties they had to surmount, to the slowness of execution caused by the absence of convenient tools, the want of proper materials, &c., the productions and profits were inconsiderable. They began at length to procure the articles of which they stood in need from Geneva, and afterwards from England; but the high prices which these articles cost induced many of the workmen to attempt to provide them for themselves. They not only thus succeeded in rivaling foreign tools, but they eventually made many superior ones, till then unknown. From that period they have constantly invented other instruments in order to facilitate and perfect the art of watchmaking; and at the present moment the manufacture of watchmaking tools and appurtenances is become a branch of industry of so much importance, as to enable the inhabitants to supply them to those countries from whence they formerly imported them.

It is about a century since a few merchants began to collect together small parcels of watches in order to sell them in foreign markets. The success which attended these speculations induced and encouraged the population to devote themselves still more to the production of articles of ready sale; so much so, that nearly the entire inhabitants have embraced the watchmaking trade. The population has increased threefold, independently of the great number of workmen who are established in almost all the towns of Europe, in the United States of America, and even in the East Indies and China. From this period a great change has taken place in the country of Neuchatel, where, notwithstanding the barrenness of the soil and the severity of the climate, beautiful and well-built villages are everywhere to be seen, connected by easy communications, together with a very considerable and industrious population.

The spirit of adventure is very strong among the industrious inhabitants of the Jura Mountains. A great many of them have travelled into very remote countries, whence some have returned with considerable fortunes. A few years ago a watchmaker of Neuchatel found his way to China, where he amassed a handsome property by importing watches; and he returned home since, accompanied by a young Chinese, whom he caused to be instructed in the trade, and who afterwards sailed for Canton to establish a business there.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical goods, or kindred articles:—

2019. THOMAS GREAVES, of Birmingham, in the county of Warwick, Jeweller, for an invention of "Improvements in the construction of solitaires and studs, applicable also to snap fastenings for boots, gloves, and other dress purposes."—Dated 2nd June, 1875.
2147. MARIE LEON PAUL HANS, of Vincennes, department of the Seine, France, a Captain in the French Artillery, and HIPPOLYTE ALEXANDRE HYACINTHE HERMARY, of 43, Rue St. Dominique, St. Germain, in the city of Paris, France, a Captain in the French Artillery, for an invention of "Improvements in barometers."—Dated 11th June, 1875.
2242. JOSEPH NORMAN HARMER, of Whittlesea, and ALFRED STAFFORD WRIGHT, of Doddington, both in the county of Cambridge, for an invention of "Improvements in the manufacture of watchmakers' peg-wood and other similar articles, and in tools or apparatus employed therein."—Dated 18th June, 1875.

Grants of Provisional Protection for Six Months.

1928. To THOMAS WILLIAM GREAVES, of Birmingham, in the county of Warwick, for the invention of "Improvements in solitaires."
1951. And to CHARLES BESANÇON, of Boulevard de Strasbourg, 23, at Paris, Gilder, for the invention of "An improved spring button link or fastener."
2019. To THOMAS GREAVES, of Birmingham, in the county of Warwick, Jeweller, for the invention of "Improvements in the construction of solitaires and studs, applicable also to snap fastenings for boots, gloves, and other dress purposes."
2140. To WILLIAM SOUTHWOOD, of South Crescent, in the county of Middlesex, Civil Engineer, for the invention of "Improvements in date and month indicators, chiefly for attachment to clocks and other time-keepers."
2147. To MARIE LEON PAUL HANS, of Vincennes, department of the Seine, France, a Captain in the French Artillery, and HIPPOLYTE ALEXANDRE HYACINTHE HERMARY, of 43, Rue St. Dominique, St. Germain, in the city of Paris, France, a Captain in the French Artillery, for the invention of "Improvements in barometers."
2194. To WILLIAM BROOKES, of 62, Chancery Lane, in the county of Middlesex, Patent and Registration Agent, for the invention of "Improvements in watches, chronometers, and such like time-keepers."—A communication to him from abroad by Frederic Fitt, of the city of Ottawa, in the county of Carleton, in the province of Ontario, in the dominion of Canada.

Inventions Protected for Six Months, on the deposit of complete Specifications.

1945. LEANDER EATON, of Worcester, in the county of Worcester, state of Massachusetts, United States of America. "Regulating chronometers, watches, and clocks."

Patents Granted in Foreign States.

FRANCE.

- 105,573. ULMANN, for "Improvements in the manufacture of lace-buttons and gold and jewellery buttons and medallions."—Dated 2nd November, 1874.
- 105,594. LE CLERC, for "Fastenings for jewellery and dresses."—Dated 7th November, 1874.
- 105,762. OGNARD, jun., for "Improvements in the manufacture of clock-work, especially for watches and toys."—Dated 20th November, 1874.
- 105,790. JEFFERYS, for "Improvements in studs, solitaires, and other fastenings or ornaments for dress."—Dated 21st November, 1874.—(English Patent, 31st October, 1874.)
- 105,849. DESBORDES, of Paris, for "Improvements in manometers, barometers, dynamometers, pyrometers, indicators, metallic thermometers and other similar instruments."—Dated 27th November, 1874.
- 106,026. MALFAIT, for "Clocks with moving figures operating the pendulum."—Dated 8th December, 1874.

(Certificate of Addition.)

- 102,232. COURT, for "Improvements in jewellery."—Dated 31st October, 1874.
2335. AUGUSTE CONOD, of Lausanne, Switzerland, Watch and Clock Manufacturer, for an invention of "Improvements in electric clock apparatus, parts of which are applicable to ordinary clocks."—Dated 26th June, 1875.

BELGIUM.

- 37,154. L. EATON, for an imported invention of "Regulating chronometers, watches, clocks, &c."—Dated 31st May, 1875.—(French Patent, 27th May, 1875.)

AUSTRIA.

15. A. FRÜMEL, of Vienna, for "A process of ornamenting and lackering plate."—1 year.—(Secret.)—Dated 13th March, 1875.

List of Patents relating to Jewellery, Watchmaking, &c., issued by the United States Patent Office.

- 161,007. Tools for Turning Metal, C. CUMMINGS, Virginia city, Nevada. *Brief.*—The construction of the cutter with a conical boss, and the shank with a countersunk hole, whereby, by means of the bolt and nut, the cutter is securely held from turning while at work, and a perfect degree of adjustment is permitted.
- 161,211. Clock Cases, HENRY J. DAVIES, Brooklyn, N.Y. *Claims.*—1. The entablature, A, arranged in an elevated position, and constructed to receive and support the clockwork, and the glass shade arranged over and enclosing the clock movement. 2. The elevated entablature constructed to receive and support the clock movement, and the glass shade enclosing said movement, the pendulum of the clock passing downwardly through said entablature and vibrating within a case below the entablature.
- 161,236. Mainspring for Watches, C. HUNTER, Elgin, Ill. *Brief.*—A mainspring having a tongue cut near its outer end to engage in a suitable recess in the barrel, and act as a safety attachment of the spring and barrel.
- 161,239. Stem-setting, Watches, J. F. U. FURGENSON, Locle, Switzerland. *Brief.*—In a stem-setting watch the combination of a sliding pin working in the stem and a ring surrounding said stem, whereby the setting mechanism is thrown into gear by pressure upon said ring, transmitted through said sliding pin.
- 161,244. Watch Plates, F. A. LANGE, Glashutte, Saxony. *Brief.*—A watch plate provided with a slot, through which the barrel arbor may pass, and the barrel thus be removed without raising the plate.
- 161,262. Stem-winding Watches, C. S. MOSELY, Elgin, Ill. *Brief.*—Main-spur wheel is chambered out, the crown, or mitre wheel gearing with the winding stem, being inserted in chamber. An intermediate gear-wheel, connecting the mainspring wheel, and the one on the winding arbor is carried on a plate pivoted on mainspring wheel, and so kept normally out of gear with winding arbor.
- 161,306. Watch-keys, ALBERT WANNER and CHARLES A. WANNER, New York. *Brief.*—A watch-key consisting of a barrel composed of two sections, each section having one side of its interior of a width equal to the width of the arbor to be wound, and two sides at right angles thereto and parallel with each other, said sections being permanently connected together by a cylinder or collar, as shown, whereby an imperceptible joint is formed, and the corners of the arbor to be wound are prevented from acting upon the meeting points of the sections composing the barrel.
- 161,297. Ornamental Chains, C. THIERY, Newark, N.J. *Brief.*—An ornamental chain composed of a series of separate rings or links, united by secondary chains passed through said main rings or links.
- 161,421. Watch-keys, HENRY LOHMEGER, Shreveport, La. *Brief.*—The watch-key screws into or upon a hollow push-rod attached to a stud rising from the catch spring.
- 161,513. Watches, J. R. HOPKINS, Washington, D.C. *Brief.*—A watch movement in which the operative parts are placed upon and revolve with a centrally-pivoted spring barrel, and the balance wheel is pivoted at the centre of such motion.
- 161,674. Pendulum Clocks, F. ECKEL, New York. *Brief.*—The crutch wire and anchor escapement work upon the same axis, which forms a flexible joint to alter their position, as the position of the clock frame is altered.
- 161,712. Watch Cases, SIMON B. SIMON, New York. *Claim.*—A cylindrical watch case constructed as described.
- 161,725. Stem-winding Watches, CHARLES V. WOERD, Waltham, Mass. *Brief.*—The means for actuating the mechanism whereby the watch is changed from a stem-winder to a stem-setter, consisting of the combination, with a watch of a cam, and a thumb catch for actuating the cam, and the flattened surface or landing whereby the cam is caused to rest steady after being raised until again pressed back into the case.
- 161,813. Calendar Movements of Clocks, THOMAS H. MOTT, New York. *Brief.*—A notched incline, a four-year wheel with teeth of varying length, and a spring dog, with downwardly projecting pin, act in combination, so that in the longest months all the notches are left exposed for engagement with the pin, and in the shorter months one or more of the notches are covered by the longer teeth of the wheel, to permit the pin to pass directly to the notch representing the first of the month, preparatory to a new revolution.
- 161,822. Cannon Pinions for Watches, S. RAMEY, Pataskala, Ohio. *Brief.*—A cannon pinion is firmly united to the upper portion of a friction sleeve, and the lower portion of the sleeve is split part of its length to form a spring to clasp the arbor.
- 161,957. Watch-spring Equalizers, C. HANSON, Huddersfield, England. *Brief.*—A spring pivot, acting through suitable mechanism upon a lever, presses it upon the barrel with greatest force when the spring is fully wound, the pressure being gradually diminished as the spring is unwound.
- 161,969. Dies for forming Bezets on Metallic Backs for Jewellery, C. KNAPP, New York. *Brief.*—A blank of the desired outline is stamped from a plate, and at the same time a rim turned up. The edges of the rim so formed are bent inwardly by the dies claimed, the upper die having a projecting flange that carries the rim down into a groove in the lower die. A part only of the rim is operated upon at once

- 162,018. Clock-striking Mechanism. G. H. BLAKESLEY, Bristol, Conn. *Brief.*—In a rack and snail striking mechanism, the combination of the snail, stop-pin, rack, cam-pin all operating together.
- 162,735. Spring-hinges. JOSEPH ANXIN, of Brooklyn, N.Y. *Brief.*—A sleeve through which the pintle passes is placed midway between the eyes of the two leaves of the hinge. This sleeve carries a flat spring, which has one end secured to one of the leaves. The tension of this spring is adjusted by a collar and a short pin, which rests upon one leaf. *Claim.*—The movable sleeve B, having holes H, and provided with the spring A, attached in combination with the leaves C and D and pin G, all constructed and operating as and for the purpose set forth.
- 162,896. Magic Lanterns. A. G. BRZBY, of Philadelphia, Pa., *Claim.*—1. The combination of the body A of a stereopticon or magic lantern with the cover B, hinged to one side of the said body, as set forth. 2. In a magic lantern, a lamp and chimney combined with the top of the body, substantially as described, so as to permit the withdrawal and replacing of the said lamp and chimney, as specified. 3. The lens-holder D, perforated in the manner and for the purpose described. 4. The lens-holder D and its flange f, in combination with the studs e at the end of the box. 5. The chimney frame composed of the endless strips m and n of sheet metal and the connecting-strips p, with their grooves x, x.
- 63,000. Stands for Stereoscopes and Graphoscopes, JAMES CREMER, of Philadelphia, Pa. Application filed 14th April, 1875. *Claim.*—The adjustable stand for stereoscopes and graphoscopes, consisting of the handle 1, the socket-piece 2, the clamping hinge-joint 6, and the base a', the said parts being constructed and arranged substantially in the manner described, for the purposes hereinbefore set forth.
- 163,125. Clock-escapements, GEO. W. WHITE and WALTER I. LEARY, of Edenton, N.C. Application filed 17th July, 1874. *Claim.*—The plates are provided at their ends with hooks, the shanks of which are pivoted to the plate, in combination with the wheel provided with the detents or teeth, shaped as shown. In a clock-escapement, a bar or arm, provided with a hinged engaging-tooth, substantially as specified.
- 163,161. Mainsprings for Watches, JNO. A. DAWSON, of Boston, Mass., assignor to Florentine A. Jones, of Schaffhausen, Switzerland. Application filed 15th December, 1874. *Brief.*—A mainspring safety attachment, consisting of a supplemental piece attached to and swinging on the outer end of mainspring, to engage in a recess in the barrel, and act as a stop-work for the winding mechanism.

STRAY WAIFS AND SCRAPS.

MULTITUDES in their haste to get rich are ruined every year. The men who do things maturely, slowly, deliberately, are men who most often succeed in life. People who are habitually in a hurry generally have to do things twice over.

AN American newspaper says that a clergyman in a certain church, on a recent occasion, discovered after beginning the service, that he had forgotten his notes. As it was too late to send for them he said to his audience, by way of apology, that this morning he should have to depend upon the Lord for what he might say, but in the afternoon he would come better prepared.

AN IRISHMAN'S LETTER.—Here is an Irish gentleman's letter to his son, in college: "My dear Son,—I write to send you two pair of my old breeches, that you may have a new coat made out of them. Also, some new socks which your mother has just knit by cutting down some of mine. Your mother sends you two pounds without my knowledge, and for fear you may not use it wisely, I have kept back half, and only send you one. Your mother and I are well, except that your sister has got the measles, which we think would spread among the other girls if Tom had not had it before, and he is the only one left. I hope you will do honour to my teachings; if not, you are an ass, and your mother and myself your affectionate parents."

A YOUNG Bostonian met with a comical mishap recently. His watch breaking down just before he set out for the opera, of which he is a frequenter, he stepped into a jeweller's shop, where he is well acquainted, for the purpose of having his time-piece repaired, and obtained a substitute for it in the shape of a handsome Swiss watch, loaned him by the courtesy of the proprietor of the establishment. Thus equipped, the young gentleman took his seat at the opera, and everything went well until the middle of the second act, when suddenly he heard strains of sweet music not in the score, wafted sweet and low in his neighbourhood. People to right of him, people to left of him, people on all sides of him queried and wondered. Finally, horrible to relate, the unfortunate man found that the music issued from his vest pocket, and as he frantically pulled out the watch, the strains of the Swiss waltz thrilled his soul. He stood not upon the order of his departure, but went at once.

JEWELLERS.

THE numerous readers of Greville's memoirs will probably remember his references to the great court jewellers, Rundell & Bridge. He mentions that the former left a larger amount of personality than had ever hitherto been sworn to at Doctors' Commons—a remarkable circumstance, which probably may be accepted as indicating that he was the wealthiest shopkeeper that England, up to that time, had ever known. Mr. Rundell left the bulk of his property to his great-nephew, one Joseph Neeld (not Neal, as Mr. Greville has it), and that gentleman's son proceeded to found a family by buying a large landed estate and marrying the sister of the philanthropic Lord Shaftesbury. The marriage was productive of neither family nor felicity, and the estates passed, at his death, to his brother, who was made a baronet in 1859. This gentleman, very ungratefully, entirely "sinks the shop" in his pedigree, which preserves as stony a silence about old Uncle Rundell, from whom all the good things come, as another family which has sprung to fame from brass-button making does of its founder. Perhaps if old Rundell, notoriously gruff and surly to most of his belongings, could have foreseen how completely he was to have been suppressed, he would have founded the Rundell Hospital instead of the Neeld family, after the fashion of George Heriot.

"Jingling Georgie" began business, in a very small way, in Edinburgh about 1580. The little shop he occupied was only pulled down in 1809, when the bellows and forge which he had used were found there. James I. took such a fancy to him that he brought him up to London, and by 1624, when he died, the Jangler had acquired a fortune of 50,000*l.*, which represented more than three times that sum to-day.

Jewellers in those days, and for long after, were bankers and money lenders also, and it is probable that a good deal of Heriot's money was made in this business. The office of court jeweller must, down to a recent date, have been in most countries one requiring a good deal of tact and discretion. Such persons were continually in the thick of all sorts of difficulties and scandals, and were applied to for help by courtiers and fine people in desperate straits. The famous firm of Boehmer & Bossinge, crown jewellers of France, who supplied the diamond necklace, no doubt "knew a thing or two" of the court gossip of those days quite as curious as the details which Charles Greville so enjoyed pumping out of the royal brother's old *valet-de-chambre*. Rundell was quite up to dealing with his "august" customers.

"What a heap of money you must make, Rundell!" said the Duke of York, walking round the shop and poking his nose into everything, one day. "Pretty well, your Royal Highness, but," with an unmistakable inflection in his voice, "we sometimes have to wait a long time for our money." A check was sent very soon afterwards.

SALE OF WORKS OF ART.

RARE AND ANTIQUE CLOCKS.

AT a sale of Mr. Gladstone's collections, held at the rooms of Messrs. Christie, Manson, & Woods, in King-street, St. James's, on the 23rd ult., among other works of art was a handsome clock, in a metal-gilt case, formed as Minerva in a chariot drawn by two horses, and standing on a plinth with a frieze of figures. This clock was purchased at Mr. Canning's sale in 1828. The highest price of any article in that day's sale was brought by a Louis XV. staircase clock, a regulator, in tall rosewood case, mounted with ormolu, scrolls, and *fleurs-de-lis*, the top surmounted by a seated figure of Cupid, the movement by Le Roy, which fetched no less than 450 guineas.

JEWELLERY CASES AND FITTINGS.

WE recently had the pleasure of visiting the various departments of Mr. Jeffreys' extensive factory in Robin Hood-yard, Leather-lane, and noticed some artistic novelties in velvet stands for jewellery; clock-shape and other handsome lamps for outside of jewellers' shop windows; stands for watches, and many other requisites for combined ornament and use in jewellery establishments. We also noticed some very handsome show cases, and in particular, one very elaborately finished in black and gold, and manufactured for the firm of Messrs. Mumford & Son, to be used by them in the Paris Exhibition, as well as another of the same description for Mr. Rimmel, the well-known perfumer. Mr. Jeffreys was a recipient of a diploma of merit for stands exhibited at the Vienna Exhibition, and, from the large and varied stock which he always keeps on hand, is enabled to fully satisfy the requirements of those needing such articles.



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HOROLOGY.

(Continued.)

III.—EARLY MECHANICAL CONTRIVANCES.

WE dealt in our last Number with the natural method by which the inhabitants of the world measured the day and night, ages and ages ago, and it is curious to trace how the intellect of man continued to investigate cause from effect; how he missed his way, and how he strayed, as it were, upon something that he was not seeking. There is no science which shows this more forcibly than that of horology, and no art more clearly demonstrates it than that of measuring time by mechanical means. Mankind has always measured its time in different ways, and according to climate and race. Euclid, the world-famed geometer, says, in his book on "Phenomena," that the visible parts of the parallels passed over by the northern stars are large in proportion as the distance of those stars from the arctic is less. "We judge of it by the time that they occupy in passing below the horizon being more or less different from that occupied above it." "This passage proves," says Arago, in his "Popular Astronomy," "that in the time of Euclid, 300 years before the Christian era, they possessed the means of subdividing time." As we have just said, different nations have different ways. We do it by the accumulation of days through the stages of weeks, months, moons, and years, on the one hand, and the subdivision of such days in seconds, minutes, and hours, on the other.

In threading our tangled way through the dimly-lit mazes of his-

tory, for the purpose of discovering who began to measure his day by periods of smaller recurrence, we are, to our utter astonishment, confronted by "that heathen Chinese!" Yes, there he stands, and boldly tells us that he was the first who supplemented star-gazing by something that he made himself. But let us hear the names of his measures. We allow him the honour of some important inventions and discoveries. Notwithstanding what has been said to the contrary, we may now justly concede to China the origin of the art of printing, the composition of gunpowder, and the magnetic compass; to these we may add the invention and manufacture of silk and porcelain. A well-informed writer says, "There cannot be the least doubt of the art of printing having been practised in China during the tenth century of our era. The precise mode in which they operate is certainly different from ours, but the main principle, that of multiplying and cheapening books, by saving the time and labour of transcription, is altogether the same. The invention of powder, as compounded of 'sulphur, saltpetre, and willow-charcoal,' is carried back by the Chinese to a very remote date, but its particular application to fire-arms seems to have been European. The Chinese name has no reference whatever to guns, and simply implies *fire-drug*, which seems to show that the composition was applied by them merely to fireworks (in which they excel at present), and other harmless or useful purposes, long before their unwelcome spirit could have suggested the use of guns to themselves or they could have borrowed the notion from Europe. With regard to the compass, the attractive power of the loadstone had been known to them from remote antiquity, but its property of communicating polarity to iron is for the first time explicitly noticed in a Chinese dictionary finished in A.D. 121. Under the head of 'Loadstone' appears this definition: 'A stone with which a direction can

be given to the needle.' The same word (*chin*) is used by them to express the magnetic and the common working-needle, as among ourselves. Père Gaubil, in his history of the T'ang dynasty, states that he found, in a work written 100 years later than the above, the use of the compass distinctly recorded."

Such are some of the Chinese scientific landmarks, and they are mentioned here for the purpose of showing the ground that a people stands upon who claim to be the first among the nations of mankind who invented mechanical methods of measuring time. We shall see.

The first mention that is known of any mechanical measuring instrument is, undoubtedly, in 2 Kings xx. 9—11. It is the sun-dial of Ahaz that is spoken of, and the shadow is said to have gone back from its point ten degrees. The sick king, Hezekiah, asks the prophet Isaiah for a supernatural sign, by which it may be known that the monarch will be healed on the third day. Part of Isaiah's answer is another question to the king, thus: "Shall the shadow go forward ten degrees, or go back ten degrees?" Hezekiah replied that "it is a light thing for the shadow to go down ten degrees: nay, but let the shadow return backward ten degrees."

Verse 11. "And Isaiah the prophet cried unto the Lord: and he brought the shadow ten degrees backward, by which it had gone down in the dial of Ahaz."

In Isaiah xxxviii. the same narrative is repeated, but in slightly different language. The king Hezekiah and the prophet Isaiah are again together, and Hezekiah is sick and receives a sign.

Verse 8. "Behold, I will bring again the shadow of the degrees, which is gone down in the sun-dial of Ahaz, ten degrees backward. So the sun returned ten degrees, by which degrees it was gone down."

We are not told what length of time a degree on this dial stood for; therefore we are unable to say how much that particular day was longer than any other. If, however, the degrees were of the same length as our meridional ones, namely, four minutes to a degree; then, that particular day would be forty minutes longer than usual. King Hezekiah lived about 750 years before Christ.

After the dial, came the *clepsydra*, or water-clock, although more than one learned authority seems to place the water-clock first in point of age. However, that does not matter much to us here; furthermore, there are very convenient places where these things can always be found when one is in any doubt about them—and where they mostly wander to—namely, the mists of antiquity. "Their origin is lost in the mists of antiquity" pretty well settles any further inquiry in a backward direction, and so closes the argument that way. And now about the dial, merely premising that there are lunar as well as solar dials, one for the moon and another for the sun.

The word "dial" is formed from the Latin *dies*, day, because of its showing the hour of the day. It was also called *sciathericum horologium*, which means "the hour by the shadow of the pin." Let us air our learning a little, now that the opportunity offers. *Skia* (σκία) is the Greek word for shadow, and *sciatheras* was the shadow-pin denoting the sun's passage across the dial. When the Romans incorporated into their own language words from the Greek, *k* was changed for *c*, and that accounts for *sciathericum*, instead of, as one would naturally expect, *skiathericum*. Curiously enough, the words "sketch," "shade," "overshadow," "shading," "to be shady," and many others, all more or less belong to *skia*. *Skene* is a tent, and *skenoso* is to dwell in a tent; *skenema* is a nest, whilst *skenos* is a hut, as well as a tent. *Skiatropeo* is to rear in the shade, that is, to bring up tenderly, covered from the storm-winds of childhood; furthermore, to wear a shade. Few persons would think that the stable-slang word, "skittish," came from the Greek *skitaloi*, but having in that language a much "broader" meaning than it has in ours. There is also another Greek word pretty well known among both masters and workmen in its English form, that is *skimpos*. Now, *skimpos*, in Greek, means lame, limping; and scamping, in English, hardly needs an explanation here, so far as turning out limping work is concerned. We must not omit to say that, among all these "sci's" and "ski's," *sciatica* has nothing to do with them. That disease has its Latin name from the Greek word *iskion*, the hip-joint, *id est*, gout in the hip.

But there is one well-known comical word that is suggested here, namely, "skedaddle." This word was not "in society" in England until the American civil war. In America, it was used by the Northern soldiery contemptuously towards the Southern. When a northern regiment fell back, it was said to "retire upon its supports," but when a Southern one did the same thing, it was said to have "skedaddled." At the first appearance of the word here the *Times* drew public attention to it. Lord Hill then wrote and stated that

it was an old Dumfriesshire word, excellent Scotch, and that it meant "to spill." The milkmaids, for instance, would cry out, "Yer skedadding a' the milk!" *id est*, "You are spilling it all." However, we can do better than that with respect to the word's origin. There is a Greek word called *skidnemi*, *skedannumi*, to scatter; *skidnamiai*, to be scattered. Now, as many of what are known as "slang" words came originally from very respectable families, it is not at all unlikely but that "skedaddle" may be much nearer to classic literature than either ourselves or brother Jonathan's children may imagine. "Skedaddle," dressed in Greek costume, looks thus: *Σκεδαννυμι*. But, for a most amusing and instructive book, full of research about such vagabond offshoots of languages from all parts of the world, we strongly recommend those interested to procure the "Slang Dictionary," published by Messrs. Chatto & Windus, of Piccadilly. It contains many thousands of words, and is a perfect storehouse of both the ancient and modern universally-spoken but unwritten tongue. Our latest edition is one of 1869, but we saw a new one, with considerable additions, advertised for publication not many months ago.

Quitting this pleasant philological gossip for a moment, we now define a sun-dial in something like the following way:—It is an arrangement of certain lines on a surface, flat, or otherwise, so contrived as that the shadow of the "style," or "pin," shall touch such certain lines at given hours, or parts of hours, of the day; or that a ray of sunlight, passing through a slit, or hole, and falling upon some time-measuring surface, shall produce the same effect. By many writers, the pin, or style, of the dial, is called the *gnomon*, a name which, perforce, throws us back on our "larnin'" (save the mark!) again.

Gnomon (pronounced *nomon*) is a Greek word, literally signifying "rule" and "judge." Another form is *gnoma*, opinion, knowledge, proof; *gnoriso*, to make known, to declare, &c.; *gnorisma*, sign, evidence; and *gnosis*, knowledge, &c.; the medical term *diagnosis*, knowing through, prognostic, knowing before the happening of the event, &c. But the juvenile reader must not think that diagnosis and diagonal are near relations, which, unless warned, he may very likely do. Diagonal is composed of two Greek words, *dia*, through, and *gonia*, a corner; idiomatically, "from corner to corner." *Gnomon* is thus printed in Greek Γνωμων.

As all dial-plates are now flat, the *gnomon*, or shadow-style represents the axis of the earth, or at least is parallel to it. The ancients used hemispherical dial-plates, and they so arranged their instruments that the shadow was thrown in a line of the north polar star. This made the hour lines on the dial circular arcs, at regular distances of one hour each, or fifteen degrees. The Greek writer, Herodotus, the "father of history," as he is called, says that his countrymen got both the *gnomon* and the sphere from the Babylonians. There was, in a former age, a science of gnomonics, but the astronomical clock has reduced it to mere scientific toying; thus, a sun-dial in a garden is a pleasing addition, and most gentlemen do not think such a place properly furnished without. We quite agree with them; it is good for trade, and for inquiring minds, and, were we in their position—were it merely a case of "send to the bank"—we would have a grand "astronomical regulator" inside the front door and a 20l. "chimer" in every room in the house.

Then there is the "gnomic projection" for maps, as well as for dialling, which, although not practically belonging to horology, is nevertheless scientifically related to it, and is very interesting to read about. We have, however, "run down" for this month, but, next one, we will resume the thread of our somewhat "free-and-easy" discourse.

RARE WORKMANSHIP IN PRESENTATION PLATE.

WE recently had an opportunity of inspecting a magnificent presentation shield presented to Earl Spencer, by the Ward Union Hunt. The shield, which is of sterling silver, weighing 230 ounces, is a magnificent piece of workmanship of rare artistic merit, and was supplied by Mr. Edward Johnson, of 89, Grafton-street, Dublin, having been manufactured by the well-known firm of Martin, Hall, & Co., of Sheffield. The centre of the plate is a representation of Diana with the dog, the four cardinal points showing stags' heads, while the other parts bear excellent representations of the different stages of hunting scenes.

The Celtic work is entirely saw-pierced and laid on, thus producing a very fine effect. The general models of the various figures are of unusual merit, and every emblem is wrought in the most artistic and finished style, of which the manufacturers may well feel proud.

FINGER RINGS.

(Continued from page 27.)

AMONG the Italians of the fifteenth and sixteenth centuries it was usual for ladies to give their lovers rings which contained their portraits, and were made with the fede, or two hands clasped. It was usual, also, for lovers to wear the rings given to them by their mistresses on holidays, as we find in England's "Helicon" (1600)—

"My songs they be of Cinthias prayse,
I weare her rings on Holly-dayes."

Bassanio and *Gratiano* give the rings which they received respectively from *Portia* and *Nerissa* to the young doctor and his clerk after the discomfiture of *Shylock*, although *Portia* had said—

"This house, these servants, and this same myself
Are yours, my lord—I give them with this ring,
Which when you part from, lose, or give away,
Let it presage the ruin of your love,
And be my vantage to exclaim on you ;"

and *Bassanio* had answered—

"When this ring
Parts from this finger, then parts life from hence.
Oh then be bold to say, *Bassanio's* dead!"

Imogen gives her husband, *Posthumus*, a ring when they part, and he gives her a bracelet in exchange. "Although," he says, "my ring I hold dear as my finger, 'tis part of it," yet he gives it up to *Iachimo* to test the virtue of his wife. In Beaumont and Fletcher's "Cupid's Revenge" a lady describes a mau's presents to his mistress—

"Given earrings we will wear,
Bracelets of our lover's hair,
Which they on our arms shall twist,
With their names carved on our wrist."

Sometimes the man gave a ring to his lady. In Davison's "Rhapsody" (1611) there is a sonnet from one who sent his mistress a gold ring with the posy "Pure and endless;" and when Richard III. brings his rapid wooing to a conclusion he gives Lady Anne a ring, saying—

"Look how this ring encompasseth thy finger—
Even so thy breast encompasseth my poor heart,
Wear both them, for both of them are thine."

In Spain the gift of a ring is looked upon as a promise of marriage, and is considered sufficient proof to enable a girl to claim her husband. In the fifteenth century love-rings occur with the orpine (*Telephium*), commonly called "midsummer men," engraved upon them, a device which was chosen because the bending leaves of that plant were presumed to prognosticate whether love was true or false. It was used for love divination late into the last century.

The gimmel, jimmel, gimbal, or gimmon ring was a pretty invention, which continued a favourite for many years. It was a twin or double ring, and took its name from the word *gemelli*. Sometimes it was formed of three pieces of gold wire, and even four occasionally. In the latter case the result was a puzzle ring—

"Thou sendest to me a true-love knot, but I
Return a ring of jimmals, to imply
Thy love had one knot, mine a triple tye."—HERRICK.

At first it was a simple love token, but afterwards was converted into a ring of affiance, the lover putting his finger through one of the loops, and his mistress, hers through the other.

"A curious artist wrought 'em
With joints so close as not to be perceived,
Yet are they both each other's counterpart ;
Her part had Juan inscribed, and his Layeta ;
(You know those names were theirs) and in the midst
A heart divided in two halves was placed ;
Now if the rivets of those rings inclosed
Fit not each other, I have forged this lye,
But if they join you must for ever part."—DRYDEN, "Don Sebastian."

Mr. Crofton Croker, in his privately-printed catalogue of Lady Londesborough's collection, describes and figures a very interesting jimmel ring consisting of three rings, which separate and turn on a pivot. The two outer ones were united by two clasped hands, concealing two united hearts upon the middle one, which was toothed at the edge. The following is the account given of the use to which the ring had been put :—

"There can be little doubt, from the specimens which have come under observation, that it had been used as a betrothing ring by an officer of the king's German legion with some Irish lady, and that the notched ring was retained by some confidential female

friend who was present as a witness at the betrothal ceremony—usually one of the most solemn and private character—and at which, over the Holy Bible placed before the witness, both the man and the woman broke away the upper and lower rings from the centre one, which was held by the intermediate person. It would appear that the parties were subsequently married, when it was usual, as a proof that their pledge had been fulfilled, to return to the witness or witnesses to their contract the two rings which the betrothed had respectively worn until married, and thus the three rings which had been separated became re-united, as in the present instance.

St. Martin's rings, which were fair to the eye, although only brass or copper within, were frequently given as presents to girls by their sweethearts. They are often referred to in old English literature to point a moral; thus, in "Plane Percivall, the Peace Maker of England" (1589), we read, "I doubt whether all be gold that glisteneth, sith St. Martin's rings be but copper within, though they be gilt without, sayes the Goldsmith." And in Braithwaite's "Whimzies" (1631) they are mentioned, with counterfeit bracelets, as commodities of infinite consequence; "they will pass for current at a May pole, and purchase a favour from their Maid Marion."

The name originated from the very extensive franchises and immunities which were enjoyed by the inhabitants of the precincts of the Collegiate Church of St. Martin's le Grande. The gilding and silvering of rings made of copper or latten was prohibited by statute 5 Hen. IV. c. 13, under a heavy penalty, and in consequence the "disloyal artificers," against whom the enactment was made, appear to have taken refuge in the hallowed district. By another statute (3 Edw. IV. c. 4) it was declared unlawful to import rings of gilded copper or latten, but the Act was not to be prejudicial or hurtful to any persons living in St. Martin's le Grande. In the same reign the like reservation of the rights of the Dean of St. Martin's and his colony of outlaws was made; and thus it was that St. Martin's rings obtained their name.

The supposed heathen origin of the marriage ring well-nigh caused its abolition during the time of the Commonwealth, as Butler tells us in "Hudibras"—

"Others were for abolishing that tool of matrimony, a ring, with which the unsanctified bridegroom is married only to a thumb."

Wedding rings, however, have been supposed by some to have been worn by the Jews prior to Christian times, but Selden says that they were only used when the Jews found them prevalent among them. About the commencement of the sixteenth century Hebrew betrothal rings, called *Mozol Touv* (a word which, freely translated, means "joy be with you," or, "good luck to you") were common among the German Jews. They were usually surmounted with a small house, temple, or tabernacle, by way of bezel.

Whatever may have been the origin of the wedding ring, the Church took care that it should be considered a holy thing.

The "Doctrine of the Masse Booke" (1554) contains a form for the hallowing of the woman's ring at wedding, in which are the following prayers—

"Thou maker and conserver of mankind, geve of spiritual grace, and graunter of eternal salvation, Lord, send thy blessing upon this ring, that she which shall weare it maye be armed wyth the vertue of heavenly defence, and that it maye profit her to eternal salvation thorowe Christ," &c.

"Hallow thou, Lord, this ring which we blesse in thy holye name; that what woman soever shall weare it may stand fast in thy peace, and continu in thy wyl and live and grow and waxe old in thy love," &c.

Holy water was then to be sprinkled upon the ring.

(To be continued.)

BIRMINGHAM MASTER JEWELLERS AND
SILVERSMITHS' ASSOCIATION.

WE have received a copy of the rules and regulations adopted by the above-named association, and are glad to learn that the recent endeavours of its members are producing the desired effect, and that the trade is awakened to the necessity of stamping out the systematic frauds which have hitherto been practised with impunity. A number of unprincipled dealers have, for some time, preyed upon all those they could possibly defraud, and the course now adopted by the association is calculated to give it a high standing in the eyes of the trade, and to increase confidence in legitimate business transactions, exciting a wholesome influence on all interested therein. We hope to be enabled to give satisfactory reports of the progress of the newly-formed association.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 37.)

IN 1686 Clement, a London clockmaker, invented the cylinder escapement, with the horizontal wheel, but this plan was not brought into use until the following century.

The engraved portrait of Edward Backwell, alderman of London, who died in 1679, was published; it represents him in a flowered gown, with a watch. In a gallery at Hampton Court Palace is the portrait of a man with a watch in his hand, the artist being Peter Van Aelst, who flourished in the seventeenth century.

There is extant a round silver watch with double case, of the time of William III., which measures upwards of 2 in. in diameter and $1\frac{1}{2}$ in. in thickness. In the centre of the dial-plate is chased a shield, with an escalop shell and a satyr's head, and on it is engraved the maker's name, "Wise, Reading." The hours are in Roman numerals, the minutes marked with strokes, with the five minutes distinguished in Arabic numbers on ovals outside the circle of strokes. The figures are engraved on silver, filled in with black enamel. The hands are of blue steel; on the back plate is inscribed, "Luke Wise, Reading;" and the cock is very richly wrought.

A touch-watch is one by which the time of day may be felt. Brequet invented *une montre de touche*, in which the hours were indicated by eleven projecting studs around the rim of the case, while the pendant marked twelve o'clock. In the centre of the back of the case was placed an index, or hand, which, when moved forward, would stop at the portion of the hour indicated by the watch, so that, by means of the studs and pendant, the time could be easily felt and counted. For instance, at half-past two the index would stop in the middle of the space between the second and third studs from the pendant. To the blind, as well as to persons travelling by night, the touch-watches must have been invaluable. The subjoined advertisements, for the recovery of touch-watches which had been stolen, occur in newspapers of the years 1678 and 1692 respectively: "Lost, out of a person's pocket, upon Wednesday night, being the 27th of November, betwixt Prince's-street and St. John's-street (Clerkenwell), an old flat, silver watch, with a studded case, and little knobs against each hour to feel what's o'clock. It was made by Mr. John Bayes. Whoever brings it to Mr. Adams, a barber in Stanhope-street, near Clare-market, shall have twenty shillings reward." In the *London Gazette*, No. 2844, February 1692, we read: "Lost, between Piccadilly and St. James'-street, on Monday last, in the evening, a gold watch, made fast in a gold studded case, with high pins on each hour; made by Mr. Taylor, at the end of Fetter-lane, Holborn. Whoever brings it to Mr. Harrison, goldsmith, at the 3 Flower de Lucys, in the Strand, shall have a guinea reward." The late Duke of Wellington possessed a fine watch of this description, which was presented to him by the King of Spain. A touch-watch, for the use of the blind, was exhibited by Mr. Dent, in 1851; it was of his own manufacture.

A satirical poem, published in 1690, entitled "*Mundus Muliebris*," describing a fashionable lady's toilette, says—

"Gold is her toothpick, gold her watch is,
And gold is everything she touches."

In the same poem references are made to the lady's diamond *croche*, which was the hook to which were chained the wearer's watch, seals, intaglios, and the like.

The English watchmakers of the seventeenth century became so famous in their craft that, lest inferior articles should be sold abroad as their productions, a law was passed in 1698 obliging all makers to put their names on their watches.

Lady Fellows has the following watches, all of which are of the seventeenth century:—A silver watch, the outer case of which is in the form of a skull; on the back is an hour-glass and the words "*Incertite hora*," "*Æterna respice*," and other sentences. The case opens at the lower jaw. The maker was J. C. Vuolf. A silver cross opening to contain a watch, but the works are absent. The numerals are engraved, and outside is a lamb engraved; at the lower end is a seal, marked with the sacred monogram. A crystal-cased watch by Jean Rousseau, in the form of a cross, with gilt engraved dial-plate and small silver dial, with a landscape in the centre. An oval metal-gilt watch by John Wrighte, engraved with sacred subjects and inscriptions; round the side is a silver band of scriptural subjects, and inside the lids the crucifix and the offerings of the Magi. A gilt-metal oval watch, with a silver belt, inscribed "*Vigilate et orate, quia nescitis horam*." It has an engraved dial-plate, with a landscape in the centre, and a silver ring with numerals. A metal watch-case in the form of a book, the cover being pierced to show the hours marked on the dial. A square table-watch, with iron works and gilt dial-plate, fitting into a silver

case. An oval silver tulip-shaped watch by Thomas Hande, the projecting leaves being chased in a chequered pateru. The silver-engraved dial has a landscape in the centre, and a crystal face. A large round watch-case without works; it has a bell, an engraved dial-plate, and a pierced back and front of arabesque scrolls. A round silver repeater and alarm watch, with a pierced and engraved side, of Bacchus on a cask, and flowers. It has a silver dial-plate, with gilt centre, and an outer shagreen case. A round silver repeater and alarm watch by Piquet, à Rennes, with a silver-gilt centred dial-plate. A round silver alarm repeater watch by Elias Weekerlin, à Zug, with pierced flower back, silver dial, gilt centre, and a steel key. A small round silver watch by J. B. Vuicar, à Zug, with a steel hand and an engraved silver dial-plate. A crystal-cased watch by Aymé Noel, carved with fluted rays, having a silver dial and enclosed in a silver outer case. An oval crystal-cased watch by Croymarie, carved with cross-lines and pellets, engraved gilt face and silver dial. A round silver watch-case, chased with vertical and eurved lines, and flowers between, with a silver dial. A small oval silver-gilt plain watch by Robert Grinkin, of London, with crystal face and silver dial. A large oval repeater-watch, with metal open-scroll side round the bell, silver back and dial. The name on the works is "Hierosme" "Grebauul." An oval metal repeater-watch, with pierced back, small silver dial, and landscape in the centre. A large silver repeater-watch by Jean Vallier, à Lyon, with pierced floriated ornament and white enamelled dial-plate. A round silver watch by Henry Terold, of Ipswich, with chased interlacing bands, and silver dial. A round silver watch by Louis Herve, with fluted rays and white enamelled face. An oval silver watch by Dupont, à Castres, with engraved side, of birds and squirrels; engraved dial-plate with indexes to show the hour, days of the week and month, age of the moon, and constellation; inside the cover is fitted a sun-dial, with box for a compass. An oval watch by G. Benard, with open gilt-metal sides, silver back and front; inside the cover is a sun-dial without the gnomon; the dial-plate is engraved with cherub, birds, and dogs, and has a silver ring with numerals. An oval gilt-metal watch by Papis, à Rennes, in plain cases, with gilt dial-plate and silver ring of numerals. An oval silver watch by William North, of London, with gilt face, and two dials showing the day of the week and month, the hour, and the age of the moon. An oval metal repeater-watch by "On Cusin, à Autun," with plain cases and pierced side, and a gilt chatelaine with filigree centres. A plain oval metal watch, with black numerals and steel hour-hand, and no minutes. An oval metal watch, with engraved silver band round the side, silver dial engraved with Time, Venus, and Cupid, and gilt border. An oval metal-gilt watch by Augustin Forard, Sedan, with plain cases, silver ring of numerals on gilt ground, and steel hour-hand. An oval silver watch by C. Gillier, à Berne, with engraved borders and centre subjects, silver ring of numerals on dial-plate, engraved with a landscape, and chased border. A round silver repeater alarm-watch by Collet, à Rouen, with pierced floriated side, and silver dial, showing the hour and days of the month. A round silver watch by John Drake, in Fleet-street, with plain outer case, silver dial, and steel hand. A round silver repeater-watch by Chamberlaine, of Chelmsford, with pierced flowers at the back, and silver dial, showing the hour and days of the month. A round silver watch by "Thos. Chamberlaine, de Chelmsforde," with silver dial. A silver-gilt octangular watch by Leonard Papon, à Gean, in plain case, with engraved dial, and no numerals. An octagonal silver-gilt watch by Josias Jolly, à Paris, with engraved border, and landscape in the centre of the face. An octangular metal-gilt watch in a plain case, with crystal face, and small dial; on the back is a pendulum which projects below the case. An octangular metal-gilt watch, the case being pierced at the back with geometrical ornaments, and in front with the *Agnus Dei*; the dial is inlaid with enamel flowers. An octangular crystal-cased watch by Patru, cut in diamond facets, and engraved dial with Cupids and flowers. An octangular metal-gilt repeater-watch, with pierced back, engraved borders, and inlaid enamel dial. An octangular metal-gilt repeater-watch, with pierced back, in floriated ornament, open sides round the bell, and silver dial with black Roman numerals. An octangular gilt repeater metal watch, with maker's initials, G. H., pierced ornaments on the back, front, and side, and nielloed silver dial, with a smaller gilt dial in the centre. An octangular silver watch by Jere Johnson, of Exchange-alley, engraved with scrolls, crystal face cut in diamond facets, and silver dial with gilt border.

The following watches, also of the seventeenth century, belong to the undermentioned persons:—Messrs. Farrer have a French gold watch, the case of which is painted on enamel, with the Holy Family and other sacred subjects. Also, a gold watch by Theodore Girard, of Blois, the back and dial of green translucent enamel, white border, and engraved with flowers. Mr. George Field has a

square gilt pedestal watch by Ferment, of London, with figures of Faith, Hope, and Charity at the angles; and another with two small medallions of busts of the electors of Germany on each side; four Cupids at the top; set all over with garnets and diamonds; resting on a base supported by four eagles and garlands between. The height is two inches and three-quarters. Mr. S. Addington has a round watch, with a painted enamel case of Venus and Adonis, in an outer case of leather ornamented with gold studs in flower patterns. Also, a circular enamelled watch by Sticler, à Berlin, painted with the rape of Europa, and portraits round the edge. Also, a metal circular watch, with enamelled painting of Mars and Venus. Also, an enamelled watch with a portrait of William III. on horseback at the battle of the Boyne in front. On the dial is painted St. George and the Dragon. It is in a gold perforated outer case. Also, a watch of quatrefoil form, with a ring of ruby enamel in the centre; round the side are stone medallions, with blue enamelled frames, resting on a swivel frame of silver-gilt, chased with masks and dolphins.

(To be continued.)

THE ACT FOR REGISTRATION OF TRADE MARKS.

THE Bill entitled "An Act to Establish a Register of Trade Marks" has just passed through the House of Lords, and been ordered by the House of Commons to be printed.

The Bill, which contains eleven clauses, provides for the registration of trade marks, under the superintendence of the Commissioners of Patents.

Among other provisions, the Act requires that the trade mark must be registered as belonging to particular goods, or classes of goods, and the registration of a person as first proprietor shall be "*prima facie* evidence of his right to the exclusive use of such trade mark, and shall, after the expiration of five years from the date of such registration, be conclusive evidence of his right to the exclusive use of such trade mark." Any one registered as the proprietor, who is not for the time being entitled to the exclusive use of a trade mark, is liable to be proceeded against by any person feeling himself aggrieved, who has the option of applying either to a court of law or equity, or to a judge in chambers for a rectification of the register, and the judge may award damages to the party aggrieved. In case of more than one person claiming to be registered as the proprietor of the same trade mark, the registrar may refuse to comply with the claims of any of such persons until their rights have been determined by the court, and "the registrar may himself submit or require the claimants to submit in the prescribed manner their rights to the court." The registrar is precluded from registering, without the special leave of the court, in respect of the same goods or classes of goods, "a trade mark identical with one which is already registered with respect to such goods or classes of goods, or so nearly resembling the same as to be calculated to deceive."

TRADE GOSSIP.

A NEW ENAMELING PROCESS.—Mr. J. H. Robinson, of Liverpool, has recently invented a process, which, he claims, is not only cheaper, but in which the resulting product is free from those specks of dirt which seem inseparable from the present methods of manufacture.

TURQUOISE and tortoiseshell jewellery is again fashionable.

A WATCHMAKER in Brooklyn, U.S., claims to have cleaned 5844 watches within the past year. This would be at the rate of about 112 per week, and if our Brooklyn friend does so good a trade in that branch alone, he cannot complain of dull times.

SEVERAL of the Connecticut clock factories have been compelled to close in consequence of having effected too many sales "on time."

THE Pope has sent the Shah a Florentine mosaic table and a bronze model of the triumphal arch of Septimus Severus, at Rome. The presents will be delivered by the Archbishop of Heraclia.—*New York Jeweller.*

We learn that there has lately been brought in the market a cheap foreign imitation of the Waltham watch manufactured by the American Watch Company. They are said to be imitations of the trade mark of the above-named watches, and purchasers will therefore do well to be cautious.

THE scheme of the examinations of the Society of Arts is to be thoroughly revised, a committee having been appointed for the purpose. The programme for 1876 will be issued as soon as the details are settled.

THE PRECIOUS STONES OF CEYLON.

THE station of Ratnapoora, about sixty miles from Colombo, is the centre of the gem-producing district, which extends for about fifty miles along the base of that mountain range. Gems are occasionally found in other parts of the hills, but seldom of sufficient value to repay a formal search; but in this district alone it is a regular occupation of the people. Here the digging is carried on in the beds of streams, and in the alluvial plains lying in the valleys upon their banks.

The gems found in this locality are the sapphire, the ruby, and topaz. The spinal ruby is also found, but more rarely; also the cat's-eye amethyst and beryl.

Gem-digging is principally carried on by the native Cingalese. In the intervals of their agricultural operations, parties of villagers, from three to six, join in partnership, contributing their labour and the implements required. They camp out for weeks, and often months, for the purpose. The work is carried on either in their own land, or on the waste or crown land, and, if successful, the produce is sold and the proceeds divided among them.

As to the locality, picture to yourself a brook, varying from ten to fifty feet wide, bordered by luxuriant vegetation, among which plumed groups of bamboo are the most conspicuous, winding through a narrow level strip of grass or rice land abutting on abrupt hills clothed with evergreen woods and clumps of palm trees, above which the higher hills ascend draped in dark primeval forest. In such a secluded spot may be seen half a dozen natives in scant clothing, and with coarse straw hats, carrying three or four long hoes, and as many sifting-baskets, and a few dried talpac palm leaves, each eight or ten feet long, to form a tent until they can build a hut from branches or materials on the spot. The first thing they do is to probe the sandy bed of the stream with a twelve-foot rod; and, from long practice, the natives, accustomed to the work, can form a good guess of the nature of the subsoil, and the probability of finding the gem deposit of which they are in search.

When the place is decided on, they form a loose dam of sticks and stones above the spot, to turn off the force of the stream, leaving a sufficient current to carry away the sand and earth excavated; within this dam a pit is dug, six or eight yards square, according to the nature of the soil, from which the sand is dragged into the tail of the stream, to be carried away by the current. The hoes used are a little larger and more hollowed than those used for scraping mud from our roads, but the handles are 15 or 20 feet long, for the layer of gravel in which the gems are found is often that depth below the bed of the stream. The men work up to their waists in water, and in favourable weather it takes four or five days, or a week, to dig a pit 12 or 18 feet deep, if all goes on favourably; but, being dug under water, it has a constant tendency to fill up by the action of the stream.

The excavators draw up their hoes carefully, and pour the gravel they contain into the baskets held by their companions standing in the water. The baskets are about 2 feet across, woven closely and evenly of fine bamboo splints, with a strong round border.

The basket-men throw out the large stones, break up the mud and gravel, and sift it in the water, which carries off all the refuse. The coarse gravel is then washed out of the baskets by a circular motion under water, while the baskets are being constantly replenished. The gems are so much heavier than the other stones that they always make their way to the conical point at the bottom of the basket, and the operator can wash out all the gravel to the last handful without fear of their escaping. He then examines this small quantity, which consists of garnet sand and seen gems, and, having secured any stones of value for cutting, throws away all the rest.

The digging for gems in dry ground is more laborious, lacking the aid of water of the stream to carry away the mud. The localities are the same; but, instead of digging in the bed of the stream, large pits are dug in the adjoining meadow land until the gem stratum is reached; the gravel is then carried in baskets to the bank of the stream and sifted in the water, as before. This, however, is a more certain mode of obtaining all the precious stones which are in the pit, many of which escape notice by the other mode, where the work is carried on under water, and, as it were, in the dark, and many good stones escape the hoe; on this account old diggings under water often prove very remunerative.—*New York Jewellers' Circular.*

(To be continued.)

KNOWLEDGE is the treasure of the mind, discretion the key to it; and it illustrates all other learning as the lapidary doth unpolished diamonds.

THE ROYAL JEWELS OF PERSIA.

I WENT," says a recent writer, "with the Turkish minister, an Italian, and a Russian lady, to see the Shah's jewels, which are certainly the greatest sight in their way that the world can show. We presented ourselves at the palace and were received by Yahya Khan, who took us out of the second and inner great court of the palace into a small quadrangle, not far from the sacred precincts of the harem. We then went up a steep staircase to a small room about 20 feet by 14 feet, where jewels to the value of \$6,000,000 or \$7,000,000 were laid out on carpets at the far end of the room. Near the jewels, on a chair, sat the Mustauful Mamalik, or Persian chancellor of the exchequer, and being a Saiyid, wore the sacred colour.

In such a show of gems as seemed to realize the wonders of Aladdin's lamp, the eye was too much dazzled and the memory too confused for description to be possible. But I remember that at the back of all was the Kaianian crown, and on either side of it two Persian lambskin caps, adorned with splendid aigrettes of diamonds. The crown itself was shaped like a flower-pot, with the small end opened and the other closed. On the top of the crown was an uncut ruby, apparently without flaw, as large as a hen's egg. In front of the crown were dresses covered with diamonds and pearls; trays with necklaces of pearls, rubies, and emeralds, and some hundreds of diamond, ruby, and turquoise rings. In front of these, again, were gauntlets and belts covered with rubies and diamonds; and, conspicuous among them, the Kaianian belt, about a foot deep, weighing, perhaps, about eight pounds, and one complete mass of pearls, diamonds, emeralds, and rubies. Still nearer to us stood a drinking bowl, completely studded with enormous jewels; a trayful of foreign orders set in brilliants; and in front of all lay a dozen swords, which are worth a quarter of a million each. Along with these were epaulets covered with diamonds, and armlets so contrived that brilliants revolved and kept up a continuous scintillation.

It was difficult among so many to single particular gems. Perhaps, however, the first place ought to be assigned to the famous "Darya-i-Nor," or "Sea of Light," the sister diamond to our Punjab trophy, the "Koh-i-Nor," or "Mountain of Light." It is $1\frac{1}{2}$ inch long, 1 inch broad, and $\frac{3}{4}$ inch thick. It has the name of Fath Ali Shah on one side, and the inscribing this name reduced the value of the diamond, so at least said Yahya Khan. It is a monstrous diamond, but not very brilliant. The Persians say that the "Sea of Light" and the "Mountain of Light" were jewels in the sword of Afrusiab, who lived 3000 years B.C. Rustum took them from Afrusiab, and they continued in the crown of Persia till they were carried away by Timour, from whom they descended to Mohammed Shah, King of Delhi, and Nadir brought them from India; but when he was slain, Ashmed Shan Abdalli carried off the Koh-i-Nor, which descended to Shah Shuja, and was taken from him by Runjet Singh. The Darya-i-Nor remained in Persia with the greater part of the other gems that Nadir brought from India.

Among the rings is one in which is set the famous Pitt diamond sent by George IV. to Fath Ali Shah. Another very large diamond is the Taja Hama, or the Diadem of the Phoenix. It seemed as big as the top of a man's thumb. There is also the finest turquoise in the world, 3 or 4 inches long, and without a flaw; and a smaller one of unique beauty, $\frac{3}{4}$ inch long and $\frac{3}{4}$ inch broad. The colour was lovely, and almost as refreshing to the eye as Persian poets pretend. There are also many sapphires as large as marbles, and rubies and pearls the size of nuts; and I am certain that I counted nearly a hundred emeralds from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inch long and 1 inch broad. In the sword scabbard, which is covered with diamonds, there is not a single stone smaller than the nail of a man's little finger. Lastly, there is an emerald as large as a walnut, covered with the names of the kings who had possessed it.

WATCHMEN WATCHED.

THE Shive Governor Company of Bethelchem, Pa., U.S., has recently introduced a new time detector, which is said to check any neglect of duty on the part of those whose business it is to watch premises or factories, and which records the visits of watchmen to certain localities.

The clock cannot be tampered with, and any dereliction on the part of the watchman is plainly revealed beyond the power of concealment.

CORRESPONDENCE OF THE YEAR 1611
CONCERNING STRIKING CLOCKS.

THE following letter, from Gilbert, Earl of Shrewsbury, to Sir Michael Hickes, of the year 1611-12, is preserved in the Lansdown MS. in the British Museum, No. 92, Art 80:—

"I perceived by you to-day that you understood My Lord Treasurer's design was to have a watch, but I conceived he wysshed a strikyng Clock, made lyke a Watch, to stande oppon a Cubbart, and suche a one (though no new one, and yet under a dozen years old) I have found oute, and send you by this bearer, which I pray you deliver to his Lordship from me, and tell him that I am very well perswaded of the truth of it or else I should be ashamed to send him so gross and rude a piece as this is, and if I hadd thought his Lordship could have well forborne it but for four or five dayes longer, I would have bestowed a new case for it, for this is a very bad one. If his Lordship would not have it stryke, either in the dayes or nights, the striker may be forborne to be wounde up, and so the Watch being wounde up it will goe alone. It will goe twenty-six houres, but I wysh it may be wounde up every mornynge or nyght aboute 8 or 9 o'Clock which will be sufficient untill the next day or nyght at the same tyme.

"I am weary with my longe journey today to Greenwich, and with waytinge on the Queen, overstaundyng myself, and therefore I will hast to bedd, and ever remayne,

"Yr very assured lov: friend,

"This Tuesday nyght

"GILB SHREWSBURY"

"To my very good friend

"Sr Michael Hycks, Knight."

AMERICAN FASHION GOSSIP.

THERE is in fine jewellery but little change in the styles this season. For earrings, the diamond solitaires, set in platinum clamps, single pearls, held in short gold hasps, and the pansy, with a diamond dew-drop glistening in the heart of the flower, are the favourites in costly jewels, while the less expensive are the coloured gold balls, cut or chased. Brooches, if worn, are of various designs according well with the rings; but these are almost altogether discarded for the pendants so much liked, which are now worn most frequently suspended from a black velvet band, instead of the weighty chains of former time. In all styles of jewellery the coloured, or bright-yellow, gold is used to the exclusion of all other.

In fancy goods there is a new and showy, but not very attractive, jewellery of antique device, inlaid, or rather burnished, with Persian colours, and set with diamonds and pearls. The workmanship upon these sets is perfect in its minuteness and very complicated, as each atom of rich colouring must be laid on with telling effect, hence it is very costly.

A very pretty style of ball earrings, with oval pendant, is of diamonds and pearls encrusted on gold. These are unique and elegant in the extreme.

Earrings shaped like conch shells, the outside of the shell encrusted with diamonds, and the inside enamelled with pink enamel, a cluster of diamonds suspended from the inside, and a cluster of diamond leaves surmounting the whole, are something new and exquisite.

In coloured ornaments, the "Bonanza," which is the name given to the large painted porcelain brooches so much worn now, and jet and rubber sets, also painted in bright colours, are the most in demand. The favourite designs for these are the heads of cherubs, Beatrice and the Italian boy. In jet, these sets cost from three to fifteen dollars a piece, and the porcelain pins, mounted in oxydized silver, range in price from three to eight dollars.

A novelty is the ivory tablet, enclosed either in a shell or amber case, with a small watch, warranted to keep good time, on the outside of the case.—*New York Jeweller.*

HOROLOGICAL LITERATURE.*

A somewhat lengthened review of this book, which is in type, has been unavoidably postponed.

* A Rudimentary Treatise on Clocks, Watches, and Bells, by Sir Edmund Beckett, Bart. (late E. B. Dennison, LL.D., Q.C., F.R.A.S.), President of the Horological Institute. Sixth Edition revised and enlarged. With numerous Illustrations. Lockwood & Co., London, 1875.

THE INVENTION OF TELESCOPES.

(Continued from page 30.)

THE result of Galileo's observations were given to the world in a small work entitled "*Nuncius Siderius*," or "News from the Starry Regions," which produced an extraordinary sensation among the learned. These discoveries soon spread throughout Europe, and were incessantly talked of, and were the cause of much speculation and debate among the circles of philosophers. Many doubted; many positively refused to believe so novel and unlooked-for announcements, because they ran counter to the philosophy of Aristotle and all the preconceived notions which then prevailed in the learned world. It is curious, and may be instructive, to consider to what a length of absurdity ignorance and prejudice carried many of those who made pretensions to learning and science. Some tried to reason against the facts alleged to be discovered; others contented themselves, and endeavoured to satisfy others, with the simple assertion that such things were not, and could not possibly be; and the manner in which they supported themselves in their incredulity was truly ridiculous. "O my dear Kepler," says Galileo, in a letter to that astronomer, "how I wish we could have one hearty laugh together! Here at Padua is the principal professor of philosophy, whom I have repeatedly and urgently requested to look at the moon and planets through my glass, which he pertinaciously refuses to do, lest his opinion should be overturned. Why are you not here? What shouts of laughter we should have at this glorious folly! and to hear the professor of philosophy at Pisa labouring with the Grand-duke with logical arguments, as if with magical incantations to charm the new planets out of the sky." Another opponent of Galileo, one Christmann, says, in a book he published, "We are not to think that Jupiter has four satellites given him by nature, in order, by revolving round him, to immortalize the Medici who first had notice of the observation. These are the dreams of idle men, who love ludicrous ideas better than our laborious and industrious correction of the heavens. Nature abhors so horrible a chaos, and to the truly wise such vanity is detestable."

One Martin Horky, a would-be philosopher, declared to Kepler, "I will never concede his four new planets to that Italian from Padua, though I should die for it;" and he followed up this declaration by publishing a book against Galileo, in which he examines four principal questions respecting the alleged planets: 1. Whether they exist? 2. What they are? 3. What they are like? 4. Why they are? The first question is soon disposed of by declaring positively that he has examined the heavens with Galileo's own glass, and that no such thing as a satellite about Jupiter exists. To the second, he declares solemnly that he does not more surely know that he has a soul in his body than reflected rays are the sole cause of Galileo's erroneous observations. In regard to the third question, he says that these planets are like the smallest fly compared to an elephant; and finally concludes, on the fourth, that the only use of them is to gratify Galileo's "thirst of gold," and to afford himself a subject of discussion. Kepler, in a letter to Galileo, when alluding to Horky, says, "He begged so hard to be forgiven that I have taken him into favour upon this preliminary condition, that I am to show him Jupiter's satellites, and he is to see them, and own that they are there."

The following is a specimen of the reasoning of certain pretended philosophers of that age against the discoveries of Galileo:—Sizzi, a Florentine astronomer, reasons in this strain: "There are seven windows given to animals in the domicile of the head, through which the air is admitted to the rest of the tabernacle of the body, to enlighten, to warm, and to nourish it; two nostrils, two eyes, two ears, and a mouth; so in the heavens, or in the great world, there are two favourable stars, two unpropitious, two luminaries, and Mercury alone undecided and indifferent. From which, and many other similar phenomena in nature, such as the seven metals, &c., we gather that the number of planets is necessarily seven. Moreover, the satellites are invisible to the naked eye, and therefore can exert no influence on the earth, and therefore would be useless, and therefore do not exist. Besides, the Jews, as well as other nations, have adopted the division of the week into seven days, and have named them from the seven planets. Now, if we increase the number of the planets, this whole system falls to the ground." The opinions which then prevailed in regard to Galileo's observations on the moon were such as the following:—Some thought that the dark shades on the moon's surface arose from the interposition of opaque bodies floating between her and the sun, which prevent his light from reaching those parts; others imagined that on account of her vicinity to the earth, she was partly tainted with the imperfections of our terrestrial and elementary nature, and was not of

that entirely pure and refined substance of which the more remote heavens consist; and a third party looked on her as a vast mirror, and maintained that the dark parts of her surface were the reflected images of our earthly forests and mountains.

Such learned nonsense is a disgrace to our species, and to the rational faculties with which man is endowed, and exhibits, in a most ludicrous manner, the imbecility and prejudice of those who made bold pretensions to erudition and philosophy. The statement of such facts, however, may be instructive, if they tend to guard us against those prejudices and preconceived opinions which prevent the mind from the cordial reception of truth, and from the admission of improvements in society which run counter to long-established customs. For the same principles and prejudices, though in a different form, still operate in society, and retard the improvement of the social state, the march of science, and the progress of Christianity. How ridiculous is it for a man, calling himself a philosopher, to be afraid to look through a glass to an existing object in the heavens, lest it should endanger his previous opinions! And how foolish is it to resist any improvement or reformation in society because it does not exactly accord with our existing opinions and with the "wisdom of our ancestors!"

It is not a little surprising that Galileo should have first hit on that construction of a telescope which goes by his name, and which was formed with a concave glass next the eye. This construction of a telescope is more difficult to be understood in theory than one which is composed solely of convex glasses, and its field of view is comparatively very small, so that it is almost useless when attempted to be made of a great length. In the present day, we cannot help wondering that Galileo and other astronomers should have made such an instrument, the use of which must have required a great degree of patience and address. Galileo's best telescope, which he constructed with "great trouble and expense," magnified the diameters of objects only thirty-three times; but its length is not stated, which would depend upon the focal distance of a concave eyeglass. If the eyeglass was two inches focus, the length of the instrument would be five feet four inches; if it was only one inch, the length would be two feet eight inches, which is the least we can allow to it, the object glass being thirty-three inches focus, and the eyeglass placed an inch within this focus. With this telescope Galileo discovered the satellites of Jupiter, the crescent of Venus, and the other celestial objects to which we have already alluded. The telescopes made in Holland are supposed to have been constructed solely of convex glasses, on the principle of the astronomical telescope, and if so, Galileo's telescope was in reality a new invention.

THE NEW JEWEL KALEIDOSCOPE.

THE above-named instrument, introduced and manufactured by the London Stereoscopic Company, is of very special interest to manufacturing and working jewellers, and others, inasmuch as it produces an endless variety of the most beautiful designs and devices of exquisite beauty. We regret that space does not permit our giving the trade a detailed description thereof at the present moment, the many important topics which we find necessary to insert precluding the possibility of our placing the full merits thereof before our readers in this number. In our next we propose to do justice to its scientific claims in an illustrated article, explaining the instrument.

BRITISH HOROLOGICAL INSTITUTE.

THE annual meeting of this institute was held on the 20th ult. The report and balance sheet showed favourable progress during the past year, and were unanimously adopted. Sir Edmund Beckett, Bart., LL.D., Q.C., F.R.A.S., was elected president, Messrs. John Jones, F.R.G.S., and Samuel Jackson, Glasgow, vice-presidents, and Mr. Thomas Mercer, treasurer.

Votes of thanks were enthusiastically passed to the president, vice-presidents, treasurer, and secretary. Messrs. James Pigott and C. H. Hawkins were re-elected auditors, with thanks for past services.

The committee of the *Horological Journal* visited the extensive clock factory of Messrs. Gillet & Bland, at Croydon, on the 27th ult., and witnessed many of the interesting operations in clockmaking. We regret that want of space precludes the possibility of our giving detailed particulars in our present number of the interesting and satisfactory visit, and which topic is unavoidably laid over for our next.

OUR GALLERY.

SIR JOHN BENNETT, F.R.A.S.

IT is our intention, from time to time, as circumstances permit, to give portraits and short biographical notices of the most prominent members of the affiliated trades represented in this Journal. On the present occasion we will commence with the gentleman whose name stands at the head of this column, and who occupies such a conspicuous position in the City region of clocks and watches.

SIR JOHN BENNETT is sprung from one of the oldest families in Sussex, and his country seat, the Banks, Mountfield, near Robertsbridge, is stated to have descended (entailed) in the family since the Conquest; and in the picturesque churchyard of the village repose many generations of the Bennetts. The family has also been for centuries connected with the City of London, for we read of Sir Thomas Bennett, of the Mercers' Company, who was an alderman in 1582, Sheriff in 1594, Lord Mayor in 1603, and Governor of the Irish Society in 1615.

Sir John Bennett was born in 1814, at Greenwich, his father, the late Mr. John Bennett, being established there as a watchmaker. The subject of our notice was educated at the Grammar School of the Leathersellers' Company, Lewisham, where he showed such proficiency that the headmastership was held in reversion for him. The sudden demise of the elder Mr. Bennett, however, sent him to the business of the watch, instead of to the desk of the pedagogue; he was, we are told, intended to pass from the school to college, and thence through the university to the Church. In consequence of his success in constructing some instruments for the Greenwich Observatory, he became a Fellow of the Royal Astronomical Society.

In 1846 he "opened shop" in Cheapside, and the writer of this notice has heard him say that the first customer who entered was a gentleman who bought a sixpenny watch-key! "What great events from trifling causes spring," saith the poet, and from a sixpenny watch-key has sprung the very extensive business at "65 and 64." If that early sixpence has been preserved, duly mounted and labelled, what a potent reminder of a successful commercial career it would now be; from opening the then small shop in the City, to becoming, not only one of the leading men in his trade, but also a landed magnate in the county of Sussex.

This being a trade journal it is not within our province to enter into the political or private life of the gentleman with whom we are now dealing; this, however, we may take upon ourselves to say, namely, that Sir John has always been in the foremost rank of both social and educational progress. He organized the Greenwich Society for the Diffusion of Knowledge, and, under the care of his brother, Dr. William Bennett, fostered it until it numbered over eleven hundred members, and a library of some twelve thousand volumes. Lectures upon various subjects were also regularly delivered by some one of the well-known scientific and literary men of the day, alternated by concerts and music of the highest order. He is exceedingly sociable in his character, and loves to surround himself with a selected circle of friends in his country home; so much so, that "Sir John Bennett's garden parties" have become a summer institution to the City. We have never been to one of them, but we know gentlemen who have, and we have seen photographic groups of visitors and scenery. From what we have heard, and what we have seen in the way mentioned, we should conclude that a day at the "Banks" must be something to be long remembered.

In the early part of his business career he commenced a life of lecturing upon trade matters. Under the title of "Women and Watchwork," he proposed to extend, or rather engraft the Swiss system upon the English, in other words, to bring women into the trade. We recollect these lectures well, and the large amount, both of public and trade interest, which they created; indeed, some of them we attended, and placed abstracts of their purport before the newspaper reading world in various ways. He, too, became a "card" in the correspondence of the daily journals, defending his views with his pen. After he had thoroughly examined the work in the Paris Exhibition of 1867, he made an extensive tour of inquiry through Switzerland. The results of that tour were given to the trade upon his return to town; but meetings were held in Clerkenwell, in which the strongest opposition to his views were manifested, and the agitation has been, so to speak, "hung up" ever since. Should it ever be revived an entirely new element will have to be taken into the controversy. The readers of this journal will at once guess that that element is the machine-made watch of America. The comparatively gradual method of change in the system of manufacture then advocated throughout the 600 gratuitous lectures of Sir

John Bennett, will now be superseded by the disciplined organization of the factory, the youthful hand, the automaton machine, and the steam-engine! Even Switzerland itself is threatened by the all-conquering power. In our opinion, it is deeply to be deplored that ever Sir John Bennett opened a shop at all. We say it with all deference and respect that, being one of the most keen-sighted business men alive, had he become exclusively a manufacturer, there would have been steam watch and clock factories in Clerkenwell a quarter of a century ago; so that, long ere this, importing watches to England would have been carrying coals to Newcastle in more senses than one. But "it was not to be," as the fatalist would say. He heard the Swiss watchmakers declare that they owed their exceptionally leading position in watch manufacture, so far as possession of the markets of Europe was concerned, to the universal system of education that prevails among them, a system that carries with it a good practical knowledge of drawing, and all that belongs to it. By means of this youthful training the Swiss boy or girl was enabled to grasp the principles and practice of the trade at a much earlier period than could otherwise be possible. This is now generally admitted on all sides, and means are, we believe, being taken to make up for past omissions.

When the agricultural movement assumed a character of reality Sir John Bennett entered into it in a most practical way. Being a landed proprietor, and an extensive hop-grower, of course he has farm servants. His waggoner being a married man with a family, he caused that useful member of the farm establishment to put down on paper the disposal of the week's wages to the uttermost farthing. It was a curious and a striking document, full of food for reflection to the upper bucolic mind, every item telling its own unvarnished tale. He went carefully over the document, with the assistance of "measter," himself; and "measter's" running commentary would have gladdened the hearts of both waggoner and "missus" to have heard. It settled the wages question so far as The Banks farm was concerned, as there was, without any application whatever, a general rise all round.

In the beginning of 1872 he was elected without opposition to the School Board, in which place he soon let it be known that the broad principles of the Act were his "platform," and that he did not intend to be over velvet-gloved towards those who sought to cripple its utility. The result of this "march forwards" of his was, that, at the following general School Board Election, a combination of the most intolerant sectarian bigotry defeated him. In using these terms we are merely repeating the language of persons who, although opposed to him in some educational details, lamented the exclusion of such an onward man from such a body. In purely political questions he has always espoused what is known as advanced Liberalism; and he was, for many years, one of the Council of the late Ballot Society.

During his year of office as sheriff, there was some friendly discussion in certain quarters, about conferring senatorial honours upon him. We believe that, were it not for Mr. Gladstone requiring Greenwich for the present, Sir John would "sweep the board" of the voters upon the Liberal side, and so represent his native borough in Parliament.

With respect to those about him in the conduct of his business, although he will have every man at his post during the hours of duty, and duty to be done when there, yet, and we speak by the book—no employer shows greater consideration towards his people. Were we to state all that we can absolutely vouch for, we might be suspected of exaggeration in this respect. Even of the numerous instances with which we are acquainted we must restrain ourselves from mentioning a single one; partly because we have no authority to do so, and would, therefore, be taking an unwarranted liberty. These are our only reasons for not giving "chapter and verse," and we trust that our readers will see that they are very good reasons too.

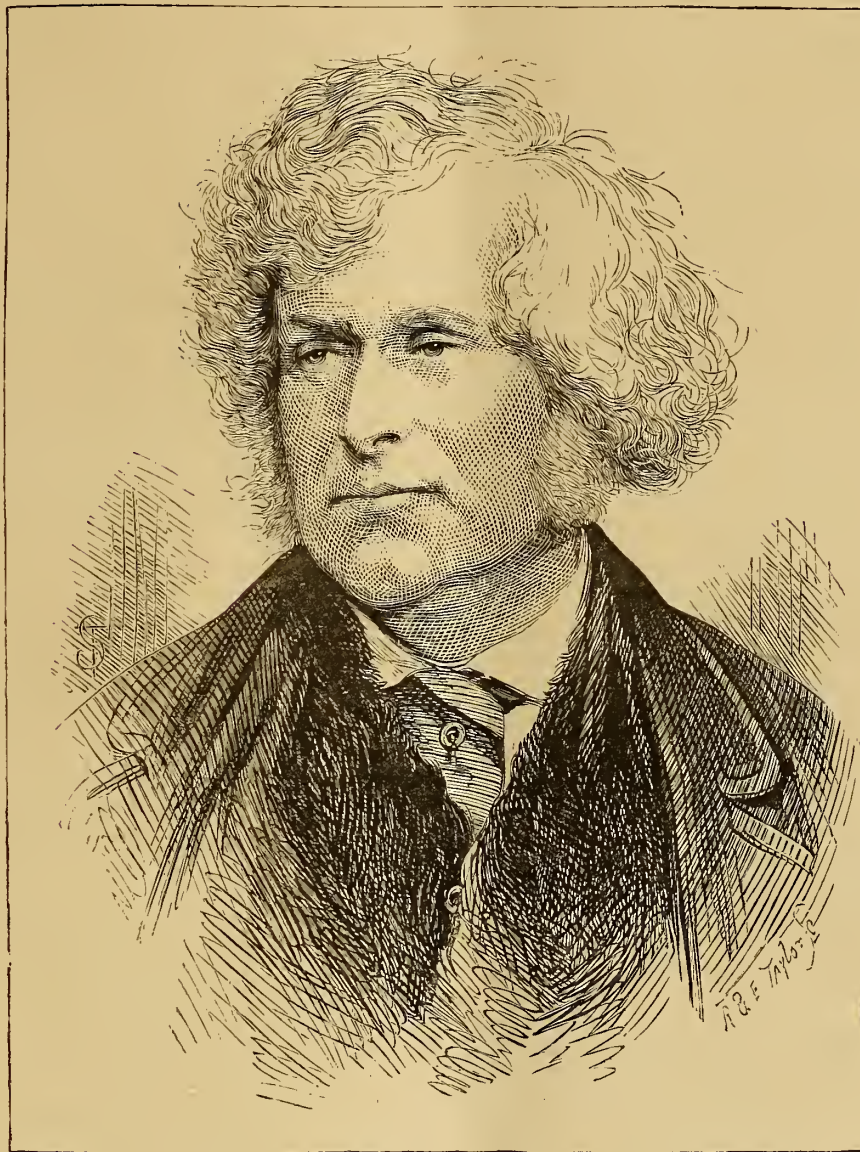
Some years ago he attracted the notice of the town by experiments on the night illumination of large dials, having a back to back face projecting from the upper part of the shop front. We believe that these were caused by some remarks respecting the proverbial gloominess of the Horse Guards' clock. We do not know what conclusions were arrived at, but it was among the most effective that we had seen. One word here about dial lighting. We have seen many plans tried, and—fail. The outside light thrown on the clock-face does very well if the clock is only a short distance from the observer. The Horse-Guards' clock is lighted in this way, but, even with the average value of eyesight, the opposite side of Whitehall is about the comfortable practical limit. Ground glass, with inside gas, is good a little bit farther off; but, in our opinion, the purely white glass that is so like porcelain, is far superior under the same circumstances. Notwithstanding all the plans that have hitherto been tried, we quite agree with an opinion that we heard many years ago, namely, that until some plan can be found to

illuminate the hands *only* of a clock, leaving the rest of the dial completely dark, we shall not have discovered the most valuable and economical principles of clock illumination. But even the most saving plan, at the present price of gas, must be very costly; and, if capitalized for, say ten years, would amount to such a sum as would astonish the thoughtless thousands who only look up at the clock at night, and walk on.

The next grand surprise of Sir John Bennett was the great Gog and Magog clock on the roof. Gracious goodness! what a sensation

that august but ponderous assembly. The removal of the Blue-coat boys from the dingy "promenades" of Little Britain, and Newgate, and Cloth Fair, to the green lanes and meadows of the country has long been an earnest desire of his. He is one of the governors of Christ's Hospital, and on grand days and "supping nights," no greater favourite with the boys has entered the school for many years than the worthy "Sheriff (that was) with all the watches."

He was elected, without opposition, Sheriff of London and Mid-



SIR JOHN BENNETT, F.R.A.S.

was in Cheapside the day the enclosing screens were taken away! 'Busmen came to a standstill; the wild hansom was paralysed; railway vans moved not; telegram boys climbed up lamp-posts; the footways were literally packed with people to look at the new "hammersmen." Complaints were made by imprisoned office-keepers, but the crowd still collected regularly every hour. However, those "striking images" have departed to country quarters, to be replaced by larger and more powerful men.

Sir John Bennett has for many years represented the "Ward of Cheap" in the Court of Common Council, but his ideas of progress and non-red-tapism are, at least, half a century in advance of

diesex for 1871-2, during the year of Lord Mayor Gibbons, his brother Sheriff being Alderman Truscott. We well remember watching on that ninth of November the departure and arrival of the procession from the windows of the Guildhall-tavern; the weather was so full of warmth and sunshine, that, but for the length of the day, it might have stood for midsummer. History, in the person of Sir John Bennett, seems destined to repeat itself. Should he live a few years longer—and he is a remarkably jovial young-looking gentleman—the watch trade of London will be able to point to the impersonation of its honour in the civic throne at the Mansion House, and exclaim:—BEHOLD! TIME IS!

THE TRIAL OF THE PYX.

THIS trial, which is one of the most ancient customs still retained—the first known writ for a trial of the Pyx dating from the time of Edward I., 1281—was held on the 21st ult., at the Goldsmiths' Hall, pursuant to the provisions of the Coinage Act, 1870. Although this is a trial of which the general public have possibly but little knowledge and in which they may take small interest, it is, nevertheless, very important both to the Deputy-Master of the Mint and his staff and also to the community at large, inasmuch as the verdict is, in fact, an acquittance to the Mint authorities for the faithful and proper discharge of their heavy and responsible duties during the past year, and an ample assurance to the public that the large amount of additional coinage of gold and silver annually manufactured at the Mint and put into circulation is up to its legal standard both as to weight and fineness. At ten o'clock, a.m., the following public officers, summoned by the Treasury to attend the trial, were assembled at Goldsmiths' Hall:—Sir Frederick Pollock, who, in virtue of his office as Queen's Remembrancer, is named in Her Majesty's Order in Council as the president at such trials; the Hon. C. W. Freemantle, Deputy-Master and Controller of the Mint; Mr. W. H. Chisholm, Warden of the Standards, who has charge of and produces the trial plates of gold and silver, and the scales, weights, and other accessories used on this occasion; together with Mr. Walter Prideaux, the Clerk of the Goldsmiths' Company, and nine freemen of the company summoned to serve as jurors.

The proceedings were opened by the Queen's Remembrancer calling upon his clerk to read the warrant ordering the trial to be held. Sir Frederick Pollock then charged the jury, remarking that, as it was the first time of his attending to preside at a trial of the Pyx, he thought the occasion appropriate for making a brief reference to the history of the important proceeding of the day and to the Royal and distinguished personage who, in former times had discharged the duty of presiding. In some years the Sovereign presided in person, inasmuch as in 1611 James I., attended by Henry Prince of Wales, presided at the trial; as in 1669 did Charles II. accompanied by the Duke of York and Prince Rupert. Four years later Prince Rupert, himself a scientific chemist, appears by the records to have been the president. Generally, however, the Lord Chancellor or Lord Keeper presided; among whom, in 1620, occurred the name of Lord Verulam, and in 1649 that of Bradshaw, then Lord President of the Council of State. On many occasions the Archbishop of Canterbury presided, and the names of Abbot, Laud, Tenison, and others were so recorded. From 1718 to 1870 the Lord Chancellor always presided, except in 1787, when the Right Hon. William Pitt was the president. The Queen's Remembrancer, after making a few further remarks upon the importance both to the officers of the Mint and also to the public of the examination the jurors were called upon to make of the work executed at the Royal Mint in the past year, left them to the performance of their duty.

The jury having informed him that they should be prepared to deliver their verdict at 6.30, p.m., and having possessed themselves of small portions of each of the gold and silver trial plates produced by the Warden of the Standards to assist them in estimating their assays of the purity of the various coins submitted to their test, retired to the laboratory of the Goldsmiths' Hall to commence their operations.

It may be observed that the present trial plates were first used at the trial of the Pyx on the 15th of July last year, having been specially manufactured of metals perfectly free from all alloy. To give an idea of the immense difficulty which is found in obtaining pure gold or silver, it may be stated that before this result was arrived at no fewer than 284 assays had to be made as to the gold plate and 548 as to the silver. The following extract from the first schedule of the Coinage Act, 1870, will show at a glance the delicacy of test to be observed by the jury in weighing and assaying the various moneys submitted to their trial, and the closeness to standard to which the officers of the Mint are obliged to work. The Imperial weight in grains only is here given:—

Coin.	Weight.	Remedy.
Sovereign	123·27447	0·20000
Half-sovereign	61·63723	0·10000
Half-crown	218·18181	0·90909
Florin	174·54545	0·72727
Shilling	87·27272	0·36363
Sixpence	43·63636	0·18181
Fourpence	29·09090	0·12121
Threepence	21·81818	0·09090

The "remedy" is the difference between the standard and actual weight allowed to the Deputy-Master in the manufacture of the various coins—a margin he has always been well within. The standard fineness for gold coins is 11-12ths fine gold and 1-12th alloy, or millesimal fineness 916·66, the remedy being millesimal fineness 0·002.

For silver coins the standard fineness is 37-40ths fine silver and 3-40ths alloy, or millesimal fineness 925·; the remedy being millesimal fineness 0·004.

The past year, as stated by the Deputy-Master of the Mint in his annual report lately published, has not been remarkable for any excessive demand for gold or silver coinage; the former having been considerably below the average, and the latter more than one-fourth less than in the preceding year. The weight and value of gold and silver coined during the year ending the 30th of June last and the amount thereof deposited in the Pyx for trial will be seen in the subjoined statement:—235·464 oz. of gold were made into sovereigns, of which two were put into the Pyx; and 43,327·120 oz. were used for half-sovereigns, out of which 241 coins were set apart for the Pyx; the total value of the gold coined being 169,621l. 16s. 2d.

Of silver, 1,781,280 oz. were converted into a coinage of the value of £489,852, out of which the following coins were placed in the Pyx—viz., 855 half-crowns, 96 florins, 915 shillings, 292 sixpences; of Maundary Money, two fourpences, 317 threepences, two twopences, and six pennies, making a total of £173 11s. 3d. silver coins set aside for this trial. By the terms of her Majesty's Order in Council of the 29th of June, 1871, the authorities at the Mint are bound to place in the Pyx for trial one coin from each 15lb. troy weight of gold coins and one out of every 60lb. troy weight of silver coins manufactured.

The tests applied by the jury are most complete and exhaustive, consisting first of counting all the money in the Pyx to see that it tallies with the statement of its contents given in by the officers of the Mint; the next test is to weigh as many coins as the jurors choose to select to see that each coin is within the prescribed remedy as to weight; these coins are next melted into an ingot, which is assayed and compared with the trial plate to test the remedy as to fineness. The residue of all the coins is next weighed in bulk and tested as to "remedy" in the aggregate. The jury next take from such residue any number of coins they may think fit and assay them separately—this last process, as will readily be understood, being the most crucial test that could possibly be applied to a manufacture of such proportions as the gold and silver coinage of this country. The verdict was delivered to the Queen's Remembrancer at 6.30, as arranged, and was in terms most satisfactory to the public and to the Deputy-Master and his staff.—*Mechanic*.

THE ELECTRIC MOTOR AND CLOCK-DIAL AT THE NEW GENERAL POST-OFFICE.

IN our last we briefly alluded to the erection of the above by the well-known firm of Messrs. Cooke & Sons, of York. Want of space prevented our giving a detailed description thereof, and which we now place before our readers, believing it to be a matter of general interest. The dial, which is 6 feet in diameter, being fixed in a position which is not very accessible, it was found necessary to place the motion work, which might require occasional examination, where it could easily be got at, and this necessitated long connecting rods (about 45 feet altogether), several pairs of bevel wheels, and sets of friction rollers, and it will therefore be understood that a motor of considerable power would be required to put all these into motion, as well as the wheel work and hands of the dial every second. It must, therefore, have been very gratifying to the contractors to find that the electric motor which they had arranged and constructed was so completely master of its work that the current sent at each beat of the pendulum of the standard clock in the gallery (*from one small Leclanché cell*) was quite strong enough to perform the required work, and to place the hands of the dial in regular motion. The motor itself consists of two pairs of electro magnets, each about three inches in length, placed opposite to each other in a flat plate of metal, a permanent magnet of the horse-shoe form being suspended between them, from which an arm carries a double ratchet at its upper end, and by means of which the requisite motion is communicated to the connecting rods and wheel. The whole is covered by a glass case, and presents a very neat appearance, and so far has given every satisfaction to the engineers and officials connected with the postal telegraph department.

A TREATISE ON PITCHINGS.

(Continued from page 3.)

IF the same circle A (Fig. 2), in place of rolling on a right line, roll on the circumference of another circle, C M D, the describing point E, from the time it leaves the point G, until it arrives at the point D, will describe another curve, C E D, more rounded than the former, this is called an *epicycloid*.

X. If the same generating circle a A (Fig. 2), in place of rolling upon the exterior or convex circumference of the circle, move itself within the interior circumference from G to H, the describing point E, which was at G, will describe another form of epicycloid, G E H; it would describe the same curve if its diameter, instead of extending from E to T, were to extend from E to the very opposite part, P, of the circumference.

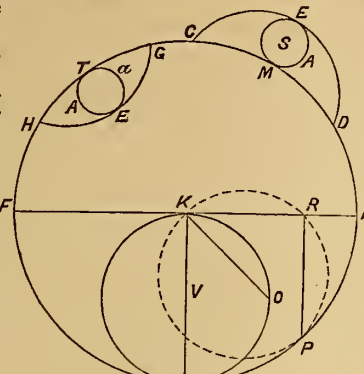


Fig. 2.

XI. If the generating circle (Fig. 2) become equal in diameter to the half of the circle in which it rolls, its circumference will always pass through the centre, K, of the circle which serves for the base, and the describing point K will pass over a diameter I K F of the same circle. It is easy, by experiment, to prove the correctness of this: make two circles of cardboard, one of which must be hollow and of a diameter double the other, which is to roll within it; but it will be easy to prove it geometrically in the following manner:—Since the diameter of the small circle is half the diameter of the large one, its half circumference, K O N, will be equal to the quarter, I N, of the other; thus the describing point, which I suppose to be at K, will have arrived at the point I, when the half circle, K O N, shall have applied all its points successively to those of the arc N I, which is its equal; thus, the point N will arrive at K, and the point K at I, without quitting the semidiameter K I; if, however, it be still questioned whether the point K of the circle K O N has always been upon the same right line K I, let us take the arc N O, which is the quarter of the generating circle, and N P, which is the eighth part of the circle, which stands for base; it is certain that these two arcs are equal, and that the point O will arrive at P, but the line O K is equal to the line P R, since O K is the chord of 90 degrees in the small circle, and that the halves of parts in the great circle are equal to whole parts in the small one; thus, the point O being at P, the line O K will coincide with the line P R, and the point K will be at R, that is to say, still upon the diameter F I. The like may be shown with regard to all the other points in which the describing point K of the small circle passes along a diameter of the large one.

XII. Let us return to the epicycloid of Art. IX (Fig 2), described by the generating circle A, rolling on the circle C D; it can be well enough seen that all the points of the generating circle will apply themselves successively to as many points of the arc C D; by this continuous application the circle A will describe an arc, C D, equal to the whole of its circumference, and the describing point will trace on this paper an epicycloid, C E D. But it is necessary to observe that precisely the same thing will happen if it be supposed that the small circle A be fixed in the air by its centre, S; that it possesses the freedom to turn only on this centre, and that the circle which serves for its base turns also on its centre, K, together with the paper on which the figure is traced; for the centre of the circle A not changing its position, whilst the arc C D is movable, and causing to turn on its centre this generating circle, will be the same thing as when, the arc C D being fixed, the circle A was movable; all the points of the generating circle will be successively applied to all the corresponding points of the arc C D, and the describing point E of the circle fixed at S will describe on the paper, or movable plane of the figure, the same epicycloid which it had described on the fixed paper when the circle was movable; the respective situations of the parts of the figure will be identical in both cases. If the circle K O N, in place of rolling within the circumference of the centre, N P I, revolve around a fixed centre V, whilst the circle N P I D, turning around its own centre K, draws along the circle K O N by its circumference, N, the describing point will describe the same line, F I, on the plane of the circle N P, as in Art. XI.

THE "GRAPHOSCOPE."

FOR VIEWING PHOTOGRAPHS, DRAWINGS, AND PICTURES OF ANY KIND, OR NATURAL FLOWERS.

ALTHOUGH the graphoscope is not entirely a new instrument, nevertheless, as its utility and great merits are not generally understood, we have thought it advisable to present a few remarks concerning it.

So simple and practical is this instrument that little need be said as to the mode of using. It can be focussed to suit any sight, whether long or short. Plain or coloured photographs, when viewed through the large lens, will be found to stand out with the roundness and reality of natural objects.

Fig. 1 shows the instrument open for viewing large objects, such as prints, photographs, paintings, &c. To open it, raise the hinged platform, under which is the large lens sliding on two brass bars, which allows of sufficient adjustment of the lens to the centre of different-sized pictures. Having put the lens in position, as shown in the diagram, raise the easel at back, and place the object upon it. To obtain the proper focus, move the easel with both hands towards the lens.

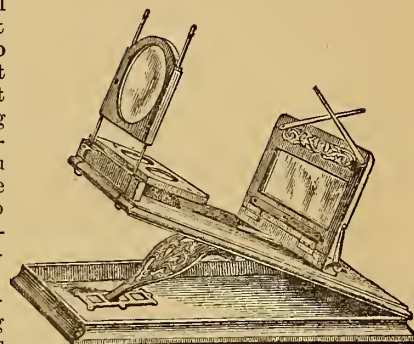


FIG. 1.

Fig. 2 shows the instrument adjusted for use as a stereoscope, in which case the large lens is replaced under the platform, and the hinged frame, with the two stereoscopic lenses, raised and fastened in position by the hook, and the easel moved, as before, to suit the vision.

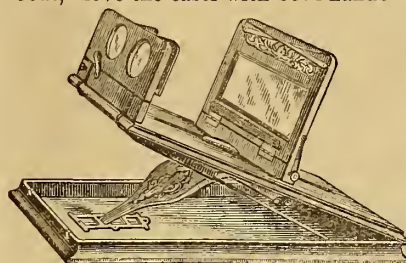


FIG. 2.

For transparent stereographs only, the instrument should be so placed that a good light passes through the lens at the back. By night, a lamp or other strong light can be used with advantage.

These instruments, which are gradually coming into general use, are manufactured by the well-known firm of Negretti & Zambra, of Holborn-viaduct and Cornhill, who also keep on hand a large and varied assortment of coloured photographs suitable for the same. The instrument, with an appropriate set of photographs, is of considerable interest, and forms a very handsome and instructive present. When its merits are fully understood and appreciated, the graphoscope will doubtless command a very extensive sale.

CHIMES AND CARILLONS.—The corporation of Manchester have decided upon having a great clock and carillons for their magnificent new town hall, and have selected Messrs. Gillett & Bland, of the Clock Factory, Croydon, to carry out the work. The clock is to strike the hours upon a bell of seven tons, and to chime the four quarters on eight bells, the time to be shown upon four 16-foot illuminated dials. An automatic gas apparatus will be fitted to the clock for turning the gas up and down, and so constructed as to suit all seasons of the year. The clock will also have an electric connection with the Royal Observatory at Greenwich. The carillon machine, on Gillett & Bland's improved patented system, is to play thirty-one tunes (a fresh tune for every day in the month) on seventeen bells, weighing altogether about 30 tons, and will also have barrels for changes similar to ringing a peal, and an ivory key-board, the same as a pianoforte, attached to the machine, so that any musician can play tunes upon the bells with the fingers as easily as playing a pianoforte or organ. Taken altogether, this will be the largest work of the kind in the United Kingdom, and will cost about 7000*l*. The 7-ton hour-bell will be the largest struck upon by a clock in this country, excepting Westminster, and about two tons heavier than the one at St. Paul's. The bells will be cast by Messrs. Taylor.—*Times*.

THE
Watchmaker, Jeweller, and Silversmith,

A MONTHLY TRADE JOURNAL.

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades,

PUBLISHED AT 8, CROSS-STREET, HATTON-GARDEN, E.C.

BIRMINGHAM AGENCY: 52, Frederick Street.

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Cheques and Post-office Orders to be made payable to A. VICTOR, at Holborn Viaduct Post Office, W.

No one is authorized to collect money without production of Printed Form of Receipt, bearing the Office Stamp.

TO ADVERTISERS.

 NOTICE.—In future the date of publication of this Journal will be the 5th of each month.

The pages of the WATCHMAKER, JEWELLER, AND SILVERSMITH present a wide field of operations, as those represented therein may bring their announcements before the immediate attention of all trades to which they are specially addressed, as well as purchasers throughout the United Kingdom, America, the Colonies, and all foreign markets.

All advertisements and correspondence should be forwarded as early as possible in each month.

SCALE OF CHARGES FOR ADVERTISEMENTS.

One Page	...	...	...	...	...	£4	0	0
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The above Scale of Charges is subject to a Discount of 10 per cent. for Orders of Six Months, and 20 per cent. for Orders of Twelve Months.

Advertisements of Businesses Wanted, Businesses for Disposal, Employers Wanting Assistants, Partnerships, and kindred announcements, are charged at the rate of 1s. 6d. for Five Lines.

Country and Foreign Subscribers are invited to furnish any Communications which they may consider interesting.

The services of an energetic and reliable person are required for the advertising department of this journal. Applications to be made by letter only, to the Publisher, 8, Cross Street, Hatton Garden, E.C.

The attention of our readers, and the trade generally, is called to the form of subscription order, which will be found on page 64. When two or more copies are forwarded to one address, or in instances of subscription clubs being formed so that the copies for such club are sent to one person, a discount of 10 per cent. will be allowed from the regular subscription rates, but in no instance will such deduction be made for subscriptions of less than one year.

SPECIAL NOTICE.

WE desire to call the special attention of our readers to the fact that, in conducting the separate departments of this Journal, we do not intend to, in any single instance, allow its editorial columns to be in the slightest manner subservient to the advertising interests of the work. By such remark we wish to convey, in *respectful* but *plain* terms, that we shall not for a moment condescend to a system of what is commonly termed "PUFFING" various firms or articles, simply and solely for the consideration of ADVERTISING PATRONAGE. We believe that such a system is not alone beneath the dignity and standing of independent journalism (such as we aspire to be classed with), but is, in the end, extremely pernicious to the organ which adopts it, bringing home the true maxim that—

"Dissemblers more often deceive themselves than others."

Taking our stand on the solid ground of FLATTERY TO NONE, BUT JUSTICE TO ALL, we shall endeavour to conduct these pages in such a manner as to show that if a proper Scientific Trade Journal cannot be supported without being compelled to lend its columns to praise any and every thing for the subservient interest of its advertisements, our services will not be given in such a manner. We are led to these remarks by several causes—firstly, because we would have our readers clearly understand that we look upon our editorial pages as journalism, and those of advertising as business interests. We shall, therefore, at all times endeavour to editorially notice and allude to any novelties or matters of scientific and other interest, whether or not the parties interested therein are Subscribers to or Advertisers in our Journal. Encouraged by the success already achieved, and by the large circulation so readily gained by so young a periodical, we may with confidence believe that general business interests of houses engaged in the various kindred trades will be well advanced by insertion of their cards in our pages; and whilst we are thankful for any and every support rendered in our business enterprise, we must impress upon all minds that such support will NOT HAVE THE SLIGHTEST INTERFERENCE WITH OUR EDITORIAL DEPARTMENT. Secondly, because, on applying for some general information on certain scientific matters concerning the recent manufacture of an article, we were informed by the proprietors that the information could not be afforded us, for the reason "*that they did not contemplate advertising at present.*" Now, we must confess our inability to understand what reference scientific information of general public interest can possibly have to *advertising*. If it were for one moment supposed that we would have thrown our pages open to freely "puff" any certain house or article in return for an advertisement, such has been entirely an erroneous impression, AND AS SUCH, WE WOULD HAVE IT CLEARLY UNDERSTOOD AT THIS EARLY STAGE OF OUR CAREER. In so placing our stand before our patrons, we trust that we shall not be viewed as assuming too independent or arrogant a position, since such is far from our intention. Of the necessity of receiving support from the various trades we represent we cannot speak too strongly, for if a trade organ is to be properly conducted, it must be strengthened by proper support; and as our remarks will in all instances be entirely based on the MERITS OF THE SUBJECT ONLY, we trust to thereby enjoy the full confidence of all, feeling well assured that when such shall have been secured our efforts will be rewarded by a realization of the truism—

"CONFIDENCE IS THE COMPANION OF SUCCESS."

THE CLOCKMAKERS' COMPANY.

THIS company gave a ladies' dinner at the Crystal Palace on the 8th ult., under the presidency of the MASTER (Mr. W. Lawley, C.C.). About forty sat down. The absence of Mr. S. Isaac, M.P., Major Bousfield, M.P., Colonel Croll, and others, was excused by telegrams. Amongst those present were—Mr. Alderman Carter, Mrs. Lawley, Mr. Deakin, M.P., Mr. and Mrs. Ries, Mr. Moore (senior warden), Miss Moore, Miss Burgon, Mr. G. S. Adams (junior warden), Mr. and Mrs. Randall, Mr. Grant, Miss Troughton, Miss Lowe, Mrs. and Miss Hyde, Mr. G. W. Adams, Mr. and Mrs. Farnan, Mr. and Mrs. Addison, Mr. and Mrs. R. Miles, Mr. Wing, Mrs. Barretto, Mrs. Durell, Mr. and Mrs. Welborne, Mrs. Patton, Miss Parker, Mr. and Mrs. Butcher, Mrs. Simpson, Mr. Deputy and Mrs. Atkins. The company having partaken of the "loving cup," the usual loyal and military toasts were proposed, followed by "The Houses of Parliament." To the latter toast Mr. Deakin, M.P., responded. "The health of the father of the company" (Mr. J. Grant) was warmly given, and Mr. Grant took occasion, in a few responsive sentences, to contrast the present state of the company with its condition fifty years ago. The contrast was one favourable to its present position. "The lord mayor and magistrates" formed the subject of the next toast, and, as may naturally be expected from the Master, he spoke in spirited terms of the public usefulness of the members of the corporation. Mr. Alderman Carter replied, concluding by proposing, in eulogistic phrases, "The health of the Master." The toast having been acknowledged, Mr. G. Moore, Mr. C. Welborne, and Mr. J. Grant, respectively, became the oratorical representatives of the wardens, the late master, and the past masters. "The health of the clerk" was also given by the Master, who remarked that during the thirty years Mr. Deputy Atkins had held that position the company had gone on increasing in prosperity and public estimation. The concluding toast, that of "The ladies," was acknowledged by Mr. Deakin, M.P. The music of the occasion was under the direction of Mr. J. J. Burgess, who was assisted by Miss Minnie Curtis, Madame Burgess Withers, and Mr. Dudley Thomas; Mr. F. H. Cozens presiding at the pianoforte.

QUEKETT MICROSCOPICAL CLUB.

AT the tenth annual meeting, held at University College on the 23rd ult., Dr. Matthews in the chair, it was shown that the society had progressed during the past year. At the regular meetings, which were generally well attended, excellent papers had been read and much useful information given. The total amount of income was 291l. 13s. 11d., leaving a balance in hand of 73l. 9s. 9d. Votes of thanks were passed to the officers, and a special vote of thanks was tendered to the council of the University College for the privilege afforded of meeting fortnightly in the library of that building. Dr. Matthews delivered the customary "President's Address," at the close of which the ballot took place, with the following result:—President, Dr. Matthews; vice-presidents, Messrs. F. Crisp, R. T. Lewis, B. T. Lowne, T. C. White; treasurer, F. W. Gay; hon. sec., J. E. Ingpen; hon. sec. for foreign correspondence, Dr. M. C. Cooke; and, to fill vacancies on committee, Messrs. M. H. Johnson, F. Oxley, T. Rogers, and J. A. Smith.

"THE POST-OFFICE WATCH AND CLOCK, GOLD-SMITH, JEWELLER, AND PRECIOUS METAL TRADES' DIRECTORY."

THE second edition of this really valuable work has recently been issued, and as it is doubtless already in the hands of every member of the various trades represented therein, it needs no comment from us in reference to the many merits and claims which are well known and appreciated by all who require to use such a book. It may, however, be stated, with all confidence, that the volume which contains such a complete and reliable classification of the various trades above named is not alone useful, but really essential to every business house interested therein.

As an example of its accuracy, we may mention that out of several thousand copies of this Journal recently addressed from the work, only three have failed to reach their destination, and these, owing to removal of the parties since the compilation of the book. We predict a most extensive circulation for the work in which so much useful and interesting matter is contained.

DISPLAY OF HISTORICAL PLATE.

AT the recent international banquet given at Guildhall, the City companies contributed to form a very interesting exhibition of historical plate, in which display many rare and curious relics of civic history were included. Amid the vast collection were—the five silver-gilt gamecocks of the Skinners' Company, as also a silver pea-hen, of great merit as a piece of antique handicraft. The Pepys cup of the Clothmakers, and a Nunn saltcellar, of the date of 1660, belonging to the same company. A very choice set of six small silver candlesticks, belonging to the Cordwainers, and the Henry-the-Eighth and Charles-the-Second covered cups, with their jingling bells, belonging to the Barbers Guild. The Fishmongers Company exhibited the Doncaster shield, formerly the property of the Marquis of Hastings, having been won by his horse, The Earl, besides their merman and mermaid ewers, both old, though widely differing in age, six high-gilt cups of various epochs, and a dolphin saltcellar of quaint design. The most central place in front of the precious array was given to the milkmaid of the Vintners, whose 'prentices have often found it no easy task to drink from the inverted farthingale of the little figure, and from the swinging pail she bears aloft, before attempting the final feat of "kissing the maid." The oldest piece of plate bearing an inscribed date was the goblet in the possession of the Innholders Company, round the rim of which drinking-vessel runs the legend, "This is the gift of Grace Gwalter, in remembrance of her deceased husband, John Gwalter, 27th February, 1599." But there were far older pieces among that priceless collection. The oldest, probably, was one of the mace-heads of the Saddlers Company, surmounted by its crest, the horse passant; a finer and far more ancient specimen than the same company's larger emblem, gilt, and showily displayed. Not later than 1186 can be the period of that first-mentioned piece of silversmith's work. There were the famed college cups of the Drapers Company, the Leigh cup of the Mercers, and a laboriously finished wagon and tun, of the year 1500, lent by the last-named guild. The Merchant Taylors and the Grocers sent a quantity of very massive plate, mostly modern, and of good design.

MILE'S ALARM TILL.

SOME method of effectually securing cash tills other than by lock and key has long been a great commercial desideratum. None but those who have charge of "the till" know fully the nuisance of having to lock and unlock over every cash transaction. Now, the key, being on a bunch with many others, is often buried in the mass, and requires searching out, never, of course, being at the top when most wanted; then, sometimes called away elsewhere hurriedly, the key is inadvertently left in the lock, leaving the contents of the till to sundry and divers risks, not to mention the annoyance that occasionally happens when keys are left at home or lost.

Yankee smartness, however, has come to the rescue, and in Mile's alarm till we have greater security than the ordinary lock affords, whilst no key is needed.

The arrangement is very ingenious, but difficult to describe. The locking apparatus is placed at the back of the drawer, but is worked by five key-plates (similar to pianoforte keys), which are underneath the drawer, and near the front, so as to be easily pressed by the fingers.

In the lock are five shifting tumblers, which can be taken out and rearranged, in any order that may be desired, in such a way that only on certain of these tumblers being raised by pressing the finger-plates forward can the drawer be opened.

For instance, it is desired that 1, 2, 5, shall be the *open Sesame*; these three tumblers are arranged, in accordance with very simple instructions given on printed directions, and the till is closed, after which it can only be opened by pressing the corresponding keys forward, 1, 2, 5. If a thief, or any one not in the secret of the arranged order, attempts to open the drawer by pressing other keys, a bell rings, giving immediate notice that some one is tampering with the lock.

The order of the tumblers may be changed daily, or as often as desired, to the extent of thirty different changes.

These alarm tills have a very large sale in the United States, and Mr. F. Sage, shop-fitter, 80 to 84, Gray's-inn-road, London, is the appointed agent for their sale in this country. We anticipate a great demand when once they become known. We are informed by Mr. Sage that he did not accept the agency until a trial of the till in his own offices for nearly three years satisfied him of its advantages and perfect security.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical goods, or kindred articles.

2298. WILLIAM BROCKELL, of 37, New Bond-street, in the county of Middlesex, for an invention of "A combined collar stud, and cravat fastener."—Dated 23rd June, 1875.
2310. ALFRED LITTLEHALES, of Birmingham, in the county of Warwick, Engraver, for an invention of "Improvements in fastenings for solitaires, sleeve links, shirt and other studs, cravats, neckties, neck and other bows, and other articles."—Dated 24th June, 1875.
2335. AUGUSTE CONOD, of Lausanne, Switzerland, Watch and Clock Manufacturer, for an invention of "Improvements in electric clock apparatus, parts of which are applicable to ordinary clocks."—Dated 26th June, 1875.
2456. MARIUS ANTONY PRADIER, of 7, Bedford-street, Bedford-square, for an invention of "The easy mode of fastening and unfastening studs, sleeve links, and solitaires, by means of the screw principle, and are in one piece."—Dated 8th July, 1875.

Grants of Provisional Protection for Six Months.

2310. To ALFRED LITTLEHALES, of Birmingham, in the county of Warwick, Engraver, for the invention of "Improvements in fastenings for solitaires, sleeve links, shirt and other studs, cravats, neckties, neck and other bows, and other articles."
2382. To JUAN NEPOMUCENO ADORNO, of Harley-street, Cavendish-square, in the county of Middlesex, Gentleman, for the invention of "Improvements in watches and clocks."
2456. To MARIUS ANTONY PRADIER, of 7, Bedford-street, Bedford-square, for the invention of "The new or improved method of fastening and unfastening the stud, sleeve link, and solitaire, by means of the screw principle."

Inventions Protected for Six Months, on the deposit of complete Specifications.

2367. CHARLES LOUIS THIERY, of Boston, in the county of Suffolk, in the state of Massachusetts, in the United States of America, praying for Letters Patent for the invention of "Improvements in machinery for manufacturing watch cases and kindred articles."

Notices to Proceed.

764. JOHN CHESHIRE, of Birmingham, in the county of Warwick, Cork-screw Manufacturer, has given notice in respect of the invention of "Improvements in solitaires, sleeve links, and other like dress fastenings and ornaments."
865. And WILLIAM BROOKES, of 62, Chancery-lane, in the county of Middlesex, Patent and Registration Agent, has given notice in respect of the invention of "Improvements in fastenings for sleeve buttons, solitaires, and studs, which improvements are also applicable to other ornamental articles of dress."—A communication to him from abroad by Antoine Benjamin Durrande, of Paris, in the republic of France, Jeweller.

Patents Sealed.

406. MATTHEW WILCOX, of Birmingham, in the county of Warwick, Manufacturing Jeweller, for an invention of "A combined seal and watch key."—Dated 3rd February, 1875.
528. LOUIS WEILL and HENRY HARBURG, both of Hatton Garden, in the county of Middlesex, Manufacturers and Importers, for an invention of "Improvements in musical boxes and other similar instruments."—Dated 12th February, 1875.

Patents on which the Stamp Duty of £50 has been paid, and dates of their production for Certificate.

2078. FREDERICK JAMES RITCHIE, of the city of Edinburgh, Scotland, Watch and Clock Maker, for an invention of "Improvements in sympathetic clocks."—Dated 10th July, 1872.

Letters Patent for Inventions which have become Void by reason of the Non-payment of the additional Stamp Duty of £100, before the Expiration of the Seventh Year from the date of such Patents, pursuant to the Act of the 16 Vict., c. 5, sec. 2.

2149. JOHN BIDDER, of Islington, ALFRED CLAUD LORRAINE LAMB, of Twickenham, and WILLIAM CAMDEN SCRIVENER, of Westminster, all in the county of Middlesex, for an invention of "An improved clasp or fastener for necklaces and other personal ornaments and wearing apparel."—Dated 17th July, 1872.
2189. JOHN JEFFERYS, of Tottenham-court-road, in the county of Middlesex, Jeweller, for an invention of "Improvements in studs and buttons."—Dated 10th July, 1868.

Patents Granted in Foreign States.

UNITED STATES OF AMERICA.

- 163,424. JOHN VARLEY, of New York, N.Y., assignor to Stephen Hickson, of the same place, for "Methods of booking gold-leaf." Application filed 20th March, 1875. *Claim.*—The method herein described of booking gold-leaf, consisting in applying each leaf to a perfectly-dried sheet of tissue-paper, or other suitable backing, and then subjecting the same to heavy pressure.
- 163,613. J. F. STEWARD, of Plano, Ill., for "Revolving stereoscopes."—Application filed 13th July, 1874.
- 163,648. JOSEPH GALL, of New York, N.Y., for "Spectacles."—Application filed 5th February, 1875.
- 163,680. JOHN A. MILLER, of Paducah, Ky., for "Watch-regulators."—Application filed 2nd February, 1875. *Brief.*—A watch-regulator in which the screw operating the regulator-arm is attached to the side of the bridge, and connected by a screw-nut with the collar of the regulating-arm.
- 163,771. ADDISON HATHAWAY, of Chicopee Falls, and F. HATHAWAY, of Springfield, Mass., for "Watch-keys."—Application filed 15th April, 1875. *Brief.*—A watch-key, having a revolving cylinder, the ratchet connection between the parts being formed by the friction of the spring in unwinding upon the sides of the cylinder.
- 163,868. V. HINMER, of New York, N.Y., for "Pendulum-clocks."—Application filed 19th October, 1874. *Brief.*—A clock so constructed that the pendulum will adjust itself in vertical position, although the frame of the clock be inclined.
- 163,981. LEANDER EATON, of Worcester, Mass., for "Regulating chronometers, watches, &c."—Application filed 8th March, 1875. *Brief.*—Adjusting parts of regulator bent in position by locking-levers.
- 164,092. EUGENE JEANJAQUET, of Springfield, Ill., for "Safety-wheels for watches."—Application filed 18th December, 1874.
- 164,112. JOHN B. ULMAR, of Boston, Mass., assignor to himself and GEORGE R. KELSO, of the same place, for "Sleeve-buttons, &c."—Application filed 19th February, 1875. *Brief.*—One end of the spring is extended and bent around the edge of the outer disk, to facilitate the adjustment of the parts.
- 164,119. CHAS. WILLS, of Attleborough, Mass., for "Watch-chain swivels."—Application filed 19th October, 1874.
- 164,177. JOHN C. W. JEFFERYS, of Tottenham-court-road, England, for "Stud-fastenings."—Application filed 16th January, 1875. *Brief.*—The helix is attached to a flat shank, and falls outside of the periphery of the front disk of the button at one side.
- 164,210. C. M. C. PRENTICE, of Monroeville, Ohio, for "Compensation pendulums."—Application filed 13th March, 1875.
- 164,384. THEOPHILUS MAYHEW, of Poughkeepsie, N.Y., for "Time-recording instruments."—Application filed 23rd January, 1875. *Brief.*—A time-recording instrument operated by pneumatic pressure upon a friction-brake, in which, when both hands are engaged, the pressure may be applied by a tube placed in the mouth, or exerted in any other suitable manner.
- 164,561. WM. H. HOFFMAN, of Passaic, N.J., assignor to the New York Steam-Engine Company, of New York, N.Y., for "Tool receptacles for metal-working machines."—Application filed 2nd March, 1875. *Brief.*—In a hollow cylindrical support, provided with openings on opposite sides, rests, on vertical pivots, a secondary cylinder, which also has openings corresponding to these in the outer shell. The inner cylinder is provided with shelves, and by turning it upon its axis until the openings are opposite the solid wall of the outer shell, the closet is closed.

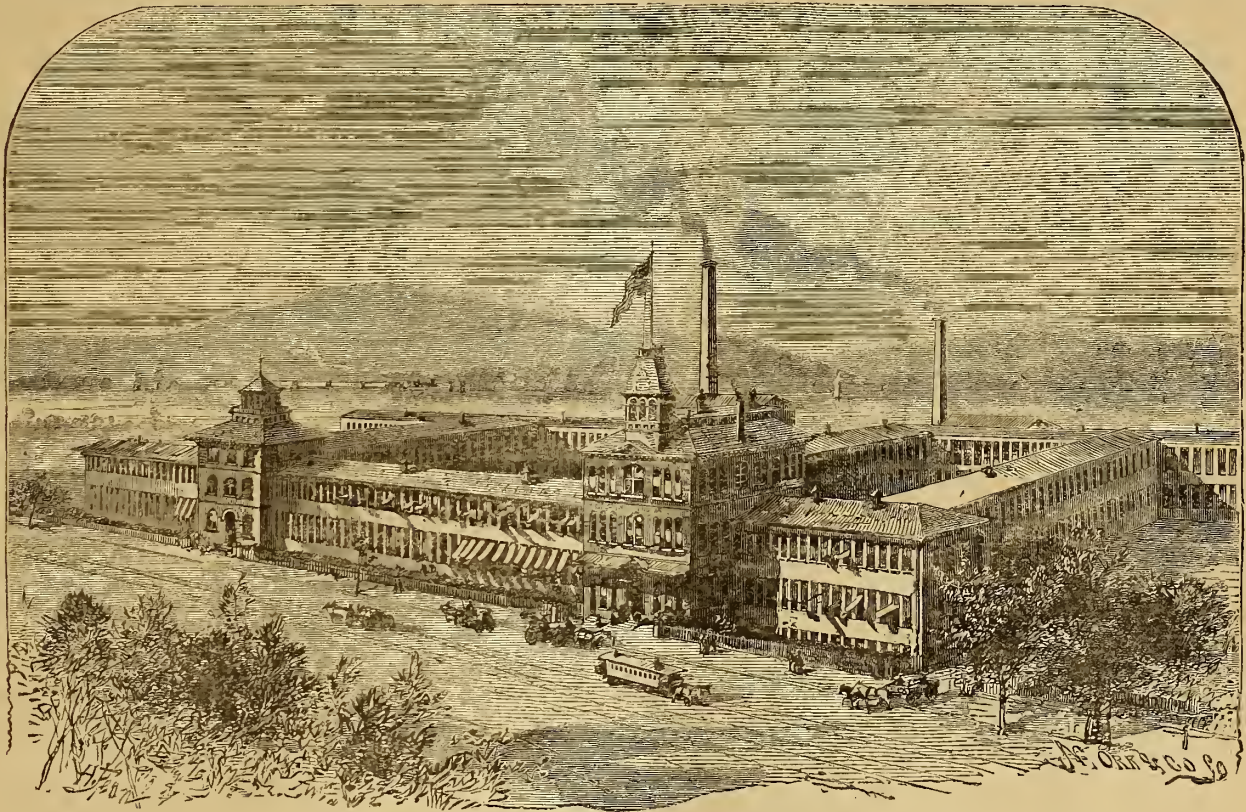
BELGIUM.

- 37,226. F. MALFAIT, for an imported invention of "Clocks with moving figures working the pendulum."—Dated 9th June, 1875.—(French Patent, 8th December, 1874.)

Trade Marks registered in the United States of America.

2535. HUGH MULLIGAN, of Philadelphia, Pa., for "Watches."—Application filed 9th April, 1875.
- "Genl. George Washington, Exhibition Watch, 1876. Philadelphia."
2597. J. EUGENE ROBERT & Co., of New York, N.Y., for "Watches."—Re-registration.—Application filed 9th September, 1872.
- "Word 'Longines.'"
2628. LOUIS STRASBURGER & Co., of New York, N.Y., for "Watches."—Application filed 30th April, 1875.—Case B.
- "Words 'R. Lanier, Geneva,' with the figures of an arrow and two stars."
2629. LOUIS STRASBURGER & Co., of New York, N.Y., for "Watches."—Application filed 30th April, 1875.—Case C.
- "Letters and words 'James Picard, Geneva,' and the figure of a five-pointed star."
2630. LOUIS STRASBURGER & Co., of New York, N.Y., for "Watches."—Application filed 30th April, 1875.—Case D.
- "Letters and words 'Ph. Doret, Locle,' with the figure of a Maltese Cross."
2631. LOUIS STRASBURGER & Co., of New York, N.Y., for "Watches."—Application filed 30th April, 1875.—Case E.
- "Letters and words, 'Ph. Doret, Locle,' with the figure of a crescent."

"By hand-labour it is impossible for this country to compete with Switzerland in the Watch Trade; and, if we would hold our own in Europe in this branch of industry, we must follow the example of the Americans, who have successfully used machinery in the manufacture of Watches."—*Extract from the "Times" of December 18, 1868.*



THE

AMERICAN WATCH COMPANY

(OF WALTHAM, MASSACHUSETTS)

Have been established 20 years, and within that time have produced

850,000 WATCHES OF ALL GRADES AND SIZES.

WHY American Waltham Watches are cheaper than English Watches of the same grade is explained by Sir Edmund Beckett (late Mr. E. B. Denison) in his work on Clocks, Watches, and Bells, in which he says, page 322: "Although labour is dearer in America than here, this machinery enables them to undersell English Watches of the same quality;" and that the system of making watches by machinery is the only correct one is held forth by this eminent authority in the same work, in which he says: "There can be no doubt in the mind of any one who understands machinery that this is the best as well as the cheapest way of making machines which require precision and uniformity."

FOR PARTICULARS APPLY TO

ROBBINS & APPLETON,
GENERAL AGENTS,

WALTHAM BUILDINGS, HOLBORN CIRCUS, LONDON, E.C.

THE WATCHMAKER, JEWELLER, SILVERSMITH, AND KINDRED TRADES' DIRECTORY.

The important feature of our Directory Columns will be found to be a most effectual method of keeping the Names of Firms and Manufacturers before the constant notice of the Trade.

No Charge is made for Insertion of a Two-line Entry of Name and Address of Firms whose advertisements, occupying not less than one-third of a page, appear for twelve consecutive months. In other instances, the Charge for the Two-line Entry of Name and Address is £1 ls. per annum; four lines, £1 10s. per annum; six lines, £2 2s. per annum. No Charge is made for the heading or title under which any entry appears.

BAROMETER AND THERMOMETER MAKERS.

HENDRY (W. T.) & CO., 2 and 12, Wilson Street, Finsbury, E.C. Sole Agents for the United Kingdom for Bourden's Metallic Barometers and Thermometers, Manufacturers of Aneroid Barometers, and Marine Salinometers and Hydrometers, in Metal and Glass.
MURRAY & CALLIEU, 22, St. John's Square, E.C.
NEGRETTE & ZAMBRA, Holborn Viaduct, E.C.; Charterhouse Street, E.C.; 45, Cornhill, E.C.; 122, Regent Street, W.
WEBSTER, J., 88, St. John Street Road, Clerkenwell, E.C.

BURGLAR AND FIRE PROOF SAFE MAKERS.

CHATWOOD'S, 120, Cannon Street, E.C., and Lancashire Safe and Lock Works, Bolton.

CLOCK MAKERS.

BRUGGER & STRAUB, 79, High Holborn, W.C.
CAMERER, KUSS, FRITSCHLER, & CO., 522, Oxford Street, W.C., and 2, Broad Street, Bloomsbury, W.C.
COHEN (JACOB) & CO., 36 and 37, Ely Place, E.C., and Charterhouse Street, E.C., London; and 10, Rue Béran-ger, Paris.
GILLET & BLAND, Steam Clock Factory, White Horse Road, Croydon. Exhibition Medal, 1873. Makers (to her Majesty's Government) of Worcester Cathedral Chimes at Bradford and Rochdale Town Halls, Boston, St. Stephen's Church, Hampstead, &c.; and of Clocks of every description; also patent Carillon Machines. Sole Proprietors and Makers of Patent No. 4141, for improvements in Church and other Bell Music. Established 1844.

DIAMOND MERCHANTS.

JONAS BROTHERS, 34, Ely Place, Holborn, London, E.C.
MARCUS (MAURICE) & CO., Waterloo House, Holborn Viaduct, London, E.C.
RUTHERFORD, JAMES, 2, Wilderness Row, E.C., and 83, Kirby Street, Hatton Garden, London, E.C.

ELECTRO-PLATE MANUFACTURERS.

ADKINS & SON, 4, Thavies' Inn, London, E.C.

FIRE-PROOF BOX MAKERS.

MORDAN (SAMPSON) & CO., 41, City Road, and 72, Cheapside, London, E.C.
TANN, JOHN, 11, Newgate Street, E.C.; Reliance Works, 1, Hope Street, Hackney Road, London, E.C.

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HOROLOGY.

(Continued.)

IV.—CLEPSYDRA.

THE clepsydra, or water-clock, may, in point of antiquity, claim the palm as the first purely mechanical timekeeper. Being an ancient article, the name in the original is, as may be expected, ancient also. The name is a compound of two Greek words, *klepto*, to hide, and *hudor*, water; *klepsydra*, from hidden water. When the contrivance was used specially to measure time it was given the name mentioned above. The infirmity called "kleptomania" is from the same root, the "mania" being a madness, and the "klepto" being the "hiding," otherwise, a madness for stealing or hiding things. Perhaps some of our readers may have met with well-authenticated cases in their time in which a "hiding," in the black-strap sense, would have been the most fitting treatment. We once came across a youngster of an appropriate turn of mind in that direction, who had been taken *flagrante delicto*, as the lawyers say. He pleaded, in harrowing language, that he was a poor, afflicted kleptomaniac, and "could not help it." We admitted the plea, as far it went, by stating that we were also "fearfully" afflicted with the anticlerptic furor, which always seized us when we saw any one taking what did not belong to them, and that at that moment it was coming very strongly upon us. A yard of finger-thick rattan, "operated" by the "anti," solved the problem and restored the balance of business relations in a very few minutes.

The clepsydra measured the time by the flowing of water in such a way that, as the water fell in the reservoir, an index at the outlet showed the degrees or length of time occupied by the running. The use of these instruments is, perhaps, coeval with the earliest applications of man's ingenuity. We are told that the Chaldeans and the Egyptians used them before (and afterwards in conjunction with) the sundial. Vitruvius says that Ctesibius introduced clepsydræ into Rome 245 years before the Christian era. Whilst mentioning his name, we may remark that he made the most famous water-clock that was ever known. There have been, also, clepsydræ made to tell the time by the flow of mercury. They did not all waste or run off the water, some of them indicating the hour by the change of level in the water only. It is recorded that Tycho Brahe, the astronomer, in the time of Galileo, used them for astronomical observations. This was as late as the last quarter of the sixteenth century. In Egypt they served for sunless weather when the dial would, as a matter of course, be non-effective; and their existence in that country is dated as far back as the time of Ptolemy III., which agrees with the date already given. All horological readers will be well aware that the best constructed clepsydra of that period had two important defects; one was that the running of the water was governed by the density of the atmosphere, and the other, that it ran more readily when the supply vessel was full than at any other period. About the year 1750, however, a certain M. Amontons invented an instrument of the kind free from such drawbacks.

The ancients regulated discourses by the varying states of the clepsydra, when orators or lawyers delivered speeches in public and before the tribunals; but, like the modern watch, its water prototype was multiplied to meet the necessary requirements.

Supposing that several speakers were to follow each other, then the "authorities" of the debate provided each one of them beforehand with a water-clock. These were vases only, filled with water and set running when the speaker began. Out of this practice arose the phrase, "They are still at the first water;" or, "They have reached the second" or "have begun the third water."

Another expression familiar to our boating men was also much used. When a speaker thought that his adversary's vase had done leaking, he would cry out, "You are encroaching on my water," &c., &c. Again, human nature was strongly inclined, even two thousand years ago, to love its neighbour as itself—"over the left." Here was one way in which they did their little bit of "besting" towards each other. The persons who had charge of the clepsydræ under the Court were frequently persuaded to make the hole in my "clock" very small, and in the clocks of all my enemies as large as they could with safety. The consequence of this little "friendship" was, that your water ran out in a shorter time than you expected, whilst mine was to me a profitable time longer. When they saw no chance of enlarging the outlet, they mostly managed to dab lumps of wax on the inside of the vase, so that it should not hold as much water as it would otherwise do; in order, too, to prevent discovery upon examination, these ancient innocents took care to remove the wax which they had used to decrease the capacity of the vases that they were against. We do not think that even the "heathen Chinese" has been able to improve much upon that. To be sure the game was rather risky, for if taken "red-handed" both hands and heads stood a bad chance of remaining long with their owners. We have changed all that now. Our detected knavery is wiped out by "ten shillings and costs, and don't be found out any more."

Any one so disposed may amuse himself by making a clepsydra. Here is one method of construction. Take, say, a cylindric vessel, and, by experiment, ascertain, after filling it, the line of surface when the water has been running out of it by an orifice for twelve hours. The distance between this line and the upper surface is then to be measured. As the part of the time, one hour, is to the whole time, twelve hours, so is the same time twelve to a fourth proportional, 144 (1:12::12:144). Divide the altitude of the vessel into 144 equal parts. Here the last will fall to the last hour; the three next above to the last part but one; the five next to the tenth hour, &c. Lastly, the twenty-third to the last hour.

The arithmetical reasoning is given as follows: "For, since the times increase in the series of the natural numbers, 1, 2, 3, 4, 5, &c., and the altitudes, if the numeration be in the retrograde order from the twelfth hour, increase in the series of the unequal numbers, 1, 3, 5, 7, 9, &c., the altitudes computed from the twelfth hour will be as the squares of the times 1, 4, 9, 16, 25, &c. Therefore the square of the whole time, 144, comprehends all the parts of the altitude of the vessel to be evacuated. But a third proportional to 1 and 12 is the square of 12, and consequently it is the number of equal parts into which the altitude is to be divided, to be distributed according to the series of the unequal numbers, through the equal intervals of hours. Since, in lieu of parts of the same vessel, other less vessels equal thereto may be substituted, the altitude of a vessel emptied in a given space of time being given, the altitude of another vessel to be emptied in a given time may be found; viz., by making the altitude as the squares of the times."

Hence we see the method of constructing the clepsydræ used by the ancients.

The name, too, has been given to an hour-glass of sand.

In other words, if the water be perfectly pure, and the outlet very small, the rate of descent will be something like this:—

In one half the whole time of emptying, three-fourths of the whole of the water will have passed away, while in one-fourth of the whole time seven-sixteenths of the whole will have been discharged. Again, supposing that the vessel had been kept silently fed to the upper line of surface, then the whole quantity of fluid would have run out in exactly half the time to that occupied in simply emptying one vesselful. This can be readily accounted for when we consider a "constant" in the unvarying weight of the full-fed vessel as compared with the varying weight of the merely full vessel without feeding, diminishing as it did every instant.

An ancient writer, named Sextus Empiricus, says that "the Chaldeans divided the zodiac into twelve equal parts, as they supposed, by allowing water to run out of a small orifice during the whole revolution of a star, and dividing the fluid into twelve equal parts, the time answering to each part being taken for that of the passage of a sign over the horizon."

We have said that Vitruvius had ascribed to Ctesibius of Alexandria the invention of the clepsydra; but it is plain to readers of ancient history that some method of measuring time by means of

running water, primitive though it might have been, was in operation at Athens long before the time of Ctesibius. This is stated on the authority of various passages in Demosthenes, the great orator of antiquity. These water-clocks were, on other authority, introduced to the Roman people by P. Cornelius Scipio Nasica, in the year 594, after the building of the city, or about 157 years before the birth of Christ. These statements only show how uncertain ancient history is with respect to dates and details. Another writer of the period alluded to says that the water-clocks were a Grecian invention, first brought out at Rome under the third consulship of Pompey. In the most common kinds two vessels were used, one for the emptying and one for the receiving. In the receiving vessel was a float, and upon the side was an index by which the float indicated, as the water rose, what the time was.

Of Ctesibius himself, we are told that he was an Alexandrine Greek who lived between the years 150 and 120 before Christ. It does not necessarily follow that he may not have lived both earlier and later; but the above dates may be taken as something reliable, as they are given on the authority of Pliny, the elder. Ctesibius was the instructor of Hero, the famous Hero of antiquity, about whom we cannot resist saying a word. There were two of the name, and, curiously enough, both of them were writers on mechanical subjects. It was the elder one that was the pupil of Ctesibius. The younger one is placed as living more than 700 years later than the other. He wrote a book on machines in war, one on geodesy—then meaning practical geometry, on the attack and defence of towns, on military tactics, and other similar works.

Hero, the elder, enjoyed a great reputation, so much as having been credited with the original discovery of the germ of the steam engine. Had he gone but a step further and reached its practical application, where would the world have been now? Among his writings were some on appliances in war, the raising of heavy weights, on the manufacture of darts, pneumatics, the construction of automata, and on dioptrics, or the refraction of light. Such was the Hero of our hero.

Ctesibius himself was the inventor of various hydraulic machines and of other machinery of that day; he also wrote on practical geometry. Besides the invention attributed to him of the clepsydra, he "brought out" a water-organ, a pump for raising water, and, according to Philo, of Bysantium, a mechanical contrivance similar to the modern air-gun. There is, unfortunately, nothing left behind to tell us the particulars of these inventions, except a little about the water-pump. That was much in principle like what we have now in the forcing-pump. There were two valves, an entering and exit one. The water was raised by exhaustion into a cylinder, when the entering valve closed, and the action of the piston opened the issuing one and forced the fluid onward.

The most marvellous reflections that rise in the mind of the reader after reading of all these wonderful inventions—most wonderful for the period of the world—are that the steam-engine was not evolved in some shape or another. What a "hit" that would have been, to be sure! However, we will resume this part of our subject in a future Number, when we hope to be able to describe the clepsydra of Ctesibius, and also give an illustration of it. It is a singular and wonderful piece of mechanism, and will be appreciated as such, we feel sure, when it comes under the reader's review.

THERE are eight metals more valuable than gold, as the following will show. It may be worth while to mention that the first four are never sold by the pound, but they are quoted respectively for the sake of comparison; indium, vanadium, ruthenium, rhodium, palladium, uranium, osmium, iridium. Indium, which was only discovered in 1863, is found only in the zinc-blendes of Friesburg, and is a white metal of rare brilliancy, but practically of little value. Vanadium is found in Mexico and Peru, where it exists in lead ores, under the name of vandiate of lead; ruthenium, rhodium, palladium, and iridium are all precipitates of platinum, and very hard metals, the last being insoluble in acids, except when oxidized. None of these metals are found in quantity, or free from other metals; nor are they very useful in the arts, like gold and silver, neither could they be coined into money without infinite trouble; so that there is little danger of their superseding gold and silver for useful purposes.

The producing upon plated ware or silver a lustreless, very finely-ground surface, termed by the trade, "satin finish," has been accomplished hitherto by the use of swiftly-rotating brushes made of fine wire. A manufacturing firm at Wallingford, Connecticut, have recently found that the sand blast performs this work much more rapidly and effectually, and have introduced the necessary apparatus for its employment in their large silver-plate works. By interposing rubber screens of suitable shape, any fancy patterns or letters are easily printed on the metal surface.

HOROLOGICAL LITERATURE.*

THE late Mr. Charles Frodsham, in his lecture, "A Few Facts connected with the Elements of Watch and Clock Making," thus speaks: "One of the most important facts in the advancement of every Art and Science is a knowledge of its literature. There are many valuable books on horology, which, though not up to the last idea, are at least valuable beacons to avoid the waste of time in making researches already known."

We cordially endorse that statement; and, although made in 1862, is as forcible now as the day it was uttered. But, if anything were wanted to confirm it, it is the book before us. From a comparatively small treatise published in 1850, it has now become a goodly volume of some four hundred pages, well and amply illustrated, and has found sufficient public favour to carry it into the sixth edition. The author says, in his preface, that he has incorporated the Appendix of the last edition in the present one, "besides many other alterations and additions, which would have increased the size and cost of the book if it had not been printed in smaller type than the former editions—about the same size as that Appendix." He further says that he has especially enlarged the chapter on bells. We find, however, that that chapter would have been considerably enlarged if all that is said about bells had been put into it. For instance, among the clockwork we find details of the "Cambridge and Westminster chimes," "Doncaster quarters," "Worcester and Chester Cathedral quarters," and the Royal Exchange, together with "chime tunes." Of course all these are in their proper places, being indissolubly bound up with the striking action of turret clocks; and we only mention them here to show what an amount of information upon the subject these pages afford.

The Westminster bells have an entire chapter to themselves, and here may be read all that is necessary for simply understanding the question about Big Ben the First and Big Ben the Second. The reader is also further told where to complete this knowledge.

This will be good news for the campanologists, both amateur and professional. In fact, the bell chapter occupies over forty pages, and includes particulars of the founding, weights, dimensions, and musical notes of all the great bells of Europe. We have heard some learned discourses by enthusiastic "bellmen" on the qualities and merits of famous peals. To such gentlemen we would say that the condensed information to be found in this chapter is worth more than the price of the whole book. There is, furthermore, a model specification for the guidance of those who may be residually interested in providing for their own neighbourhoods the most lovable of all loving music of either present or early homes, namely, bell music. Although the chapter is the last in the book, and not immediately connected with ourselves, we have given it the precedence on the principle of the courtesy of horology. We will now deal with our more intimate subject.

To those who may be in possession of the last edition of this work, we would say, "Keep it." The reason is, that there are some details there which have been necessarily crowded out in the present edition to make way for newer matter. The book opens with a glance at "time," and its early measurement by sundials, water-clocks, and hour-glasses. There is an equation table, and an explanation of sidereal, solar, and mean time, which those who desire to be considered intelligent would do well to read. Of the sun-measuring instruments the dipteroscope is the most modern. To those who have never seen one, we may add that its form is that of a hollow prism, that it reflects two images of the sun up to a moment of coincidence, when the two images form one, then that is solar noon. A demonstration of its action is given in the description of it.

In the clockwork all the old familiar historical escapements are reproduced. We say "familiar," because they are familiar to us; but, to the rising generation of horologists a study of them would be a most interesting novelty. Take the conical pendulum, and old De Vick's balance. A study of the action of a bottle-jack in motion would not be a bad practical beginning at this point. Of pendulums the author says—

"There seems no doubt, however, that the first person who investigated and established the mathematical theory and properties of the pendulum was Huyghens, the Dutch philosopher, in the seventeenth century, but it seems equally certain that the first pendulum clock was made for St. Paul's Church, in Covent-garden,

by Harris, a London clockmaker, in 1621, though the credit of the invention was claimed also by Huyghens himself, and by Galileo's son, and Avicenna, and the celebrated Dr. Hooke, the undoubted inventor of the balance spring of watches, and the discoverer of its theory."

It is very remarkable how enticing are mechanical pursuits to some minds, especially clock and watch work. Here is a singular instance of it.

Christian Huyghens was born at the Hague, in 1629. His father held a high position there, having been secretary to no fewer than three Princes of Orange, and was also known favourably in literature by the publication of some Latin poems, &c. The eldest brother of the mathematician came to England with William III., in his late father's post. Christian says that the idea of the pendulum first came to him in 1656, and its application to the clock is explained in his "*Horologium*," 1658.

Huyghens spent a long lifetime in pendulum experiments, as well as in other mathematical investigations. Sir Edmund Beckett seems to be certain that the first London clock was made in 1621, by Harris. Authorities differ, for Beckman, on the authority of Selden, in his preface to Hengham, mentions the famous clock-house, "with a clock to be heard by the courts of law, out of a fine imposed on the Chief Justice of the King's Bench in the sixteenth year of Edward I.," or in 1288. We have been told that this was a sundial; indeed, we have had it pointed out to us on one of the houses that formerly faced Westminster Hall. But a dial is not "heard by the courts of law," nor would Henry VI. have given the keeping of it to the Dean of St. Stephens, with 6*d.* a day for the purpose. Besides, a sundial would not want a "clock-house." We are, furthermore, told that the clock had been actually seen in the early part of Elizabeth's reign. Another writer, in 1751, says that "the first pendulum clock made in England was, in the year 1622, by Mr. Fromantil, a Dutchman." So that if we are to attach any weight to these statements, here we are again landed high and dry on the sand-bank of doubt and uncertainty.

Sir Edmund's observations on pendulums are very comprehensive, and show a life-long acquaintanceship with both the practice and the theory.

Of watches and chronometers we believe some late information will be found, as well as a hint about oil. Then again, that fruitful source of the inventor's brain, the compensation balance, has not been lost sight of. Any one plunging, or about plunging, into the agitated waters of "compensation" had better begin here. And the same also with escapements; from the verge to the chronographic, they are here. There is one of them, "the lever chronometer, which we should have liked to have seen more of, as it has had a very chequered career.

Sir Edmund gives, as one reason for not having gone into the minute details of watchmaking, the fact that "it is the less necessary now that the *Horological Journal* exists." We regret this, because a large number of his readers may never see that publication.

The *Horological Journal* is the official record of the Horological Institute. It stands upon somewhat isolated ground, and its circulation necessarily partakes of its exclusive character. So long as there is an institute, so long must there be a periodical record of that institute's doings; and the seventeen volumes of the *Horological Journal* contain more thoroughly scientific and practical information on modern horology than exists any where else in the world. We are far from deeming it a rival, because, from its elevated, official position, it can afford to look serenely down upon the troubled waters of commercial enterprise in which we are buffeting about. The journal can never be a rival to any ordinary publication embracing the broad interests of affiliated trades. It has its own mission to fulfil, and fulfils it well, and the only rivalry that we shall ever be ambitious of will be the rivalry of ability. Every watchmaker of any pretension to progressive intelligence must have the journal. We only hope that we may find a place on his table for subjects beyond the scope of the older horological lamp.

Sir Edmund Beckett mentions in his book the watch-factory systems of America. Of course, not having seen them, he has to content himself with saying very little about them. They present, however, a most marvellous indication of both mercantile and mechanical progress; in good truth, from the result of such inquiries as we have been able to make, the American machine-made watch must now be taken as an important factor in the home and colonial trade. The celebrated Waltham Company have, as our readers are already aware, established themselves firmly here in London; and since we last mentioned them, we learn that their "work" is radiating along every line of the compass. An illustrated treatise on their machinery and system of interchangeable manufacture would be a fitting supplement to the book which we now cordially recommend to our readers.

* A Rudimentary Treatise on Clocks, Watches, and Bells, by Sir Edmund Beckett, Bart. (late E. B. Dennison, LL.D., Q.C., F.R.A.S.), President of the Horological Institute. Sixth Edition revised and enlarged. With numerous Illustrations. Lockwood & Co., London, 1875.

FINGER RINGS.

(Continued from page 51.)

IN the Hereford, York, and the Salisbury missals directions are given at the marriage for the ring to be put first on the thumb, after on the second finger, then on the third, and, lastly, on the fourth finger. The rubric still ordains the fourth finger, because it is the ring finger; and the left hand is chosen, it is said, because the wife is in subjection to her husband, but this is doubtful. It is true that official rings are worn on the right hand, but the left hand has more usually been the favourite one for rings, probably because it is less used than the right.

In many parts of the continent wedding rings are worn by husbands as well as by wives. The wedding ring worn by Luther, to which we have previously referred, was a gimmel, and consisted of two perfect rings. On one hoop was set a diamond, as the emblem of power, duration, and fidelity, and, on the other, a ruby, for exalted love. On the mounting of the diamond were engraved Luther's initials, and on that of the ruby his wife's, so that when the two parts were joined the letters came close together. The motto within was, "Was Gott zusammen fuget soll kein mensch scheiden" (What God doth join, no man shall part).

Formerly widows wore their ring on the thumb, as an emblem of widowhood, and we find the following trick mentioned in the *Spectator*:—

"It is common enough for a stale virgin to set up a shop in a place where she is not known, where the large thumb ring, supposed to be given her by her husband, quickly recommends her to some wealthy neighbour, who takes a liking to the jolly widow that would have overlooked the veritable spinster."

The old wedding ring usually had its motto, which was often pretty and appropriate. We will set down a few of these posies that were once common:—

"Let lyking laste."
 "As God decreed so we agreed."
 "Knit in one by Christ alone."
 "In Christ and thee my comfort be."
 "First love Christ that died for thee,
 Next to Him love none but me."
 "Let us share in joy and care."
 "United hearts death only parts."
 "A faithful wife preserveth life."
 "This and the giver are thine forever."
 "This hath alloy, my love is pure."
 "The diamond is within."
 "I like my choice."
 "Love and live happily."

The wedding ring of St. Louis, of France, was set with a sapphire intaglio of the Crucifixion, and bore on the hoop the motto, "Dehors cet anel, pourrions avoir amour." Anne of Cleves' posy was "God sende me wel to kepe." Richard Beauchamp, Earl of Warwick, temp. Henry VI., had three daughters, who all married noblemen. Margaret's husband was John Talbot, Earl of Shrewsbury, and the motto of her wedding ring, "Til deithe depart." Alianour married Edmund, Duke of Somerset, and her motto was, "Never newe." Elizabeth married Lord Latimer, and hers was "Til my live's end." An old Earl of Hertford's wedding ring consisted of five links, the four inner ones containing the following posies of the earl's own making:—

"As circles five by art compact shows but one ring in sight,
 So trust united faithful mindes with knott of secret might;
 Whose force to break no right but greedie Death possesseth power,
 As time and sequels well shall prove. My ringe can say no more."

Lady Cathcart, on marrying her fourth husband, Hugh Maguire, in 1713, had the following posie inscribed on her wedding ring:—

"If I survive,
 I will have five."

Dr. John Thomas, Bishop of Lincoln, in 1753, married four wives, and, being of the same mind with Lady Cathcart, he selected a like motto for his fourth wife's ring, viz.:—

"If I survive,
 I'll make them five."

The community of fishermen inhabiting the Claddagh at Galway rarely intermarry with other than their own people. The wedding ring is an heirloom in a family, and is regularly transferred from the mother to the daughter who is first married, and so passes to her descendants. Many of those still worn are very old.

The women of the gipsy tribes wear plain, massive gold wedding rings, which are occasionally pawned by their possessor when in

want of money, but in most cases are scrupulously redeemed. Many superstitions are associated with the wedding ring, and some of them still linger on. It was once a widely-spread belief that a special nerve or artery stretched forth from the heart to the ring finger, and it is not a little remarkable that this notion is derived from Egypt, so that the wedding ring of to-day is placed upon a particular finger, because, many centuries ago, an Egyptian appropriated that as the ring finger, from some supposed virtue that existed in it. Macrobius writes that those Egyptian priests who were prophets, when engaged in the temple near the altars of the gods, moistened the ring finger of the left hand (which was that next to the smallest) with various sweet ointments, in the belief that a certain nerve communicated with it from the heart.

It has been thought that the wedding ring possesses certain curative powers; thus, it is believed that a sty in the eye will soon disappear after being rubbed with the "plain gold ring." Most women are very loth to take off their wedding ring, and it seldom, if ever, is allowed to leave the finger. Its loss is thought to be an evil portent of some importance. In Sir John Bramston's autobiography (1631) it is related that his stepmother dropped her ring off her finger into the sea near the shore when she pulled off her glove. She would not go home without the ring, "it being the most unfortunate that could befall any one to lose the wedding ring," and after a general search the seekers met with success.

Among Moore's juvenile poems will be found a tale called the "Ring," which is a version of an old and widely-spread German legend. A young knight, who is about to be married to a beautiful girl, places the wedding ring on the finger of a statue, thinking it to be a place of safety. When he comes for it the marble finger has turned up, and he is unable to get his ring off. He comes again to break the finger off and release the ring, when he finds the finger open, but the ring gone. He is in dismay, but obtains a new ring, with which he is married. At night, however, a spectre cold, like the marble statue, comes between the bride and bridegroom. The former cannot see it, but the latter sees it, feels it, and hears it speak these words:—

"Husband, husband, I've the ring
 Thou gav'st to-day to me;
 And thou'rt to me for ever wed,
 As I am wed to thee!"

At daybreak the spectre departs, but comes again each night, until, with the assistance of an old monk, the knight goes to a place where four roads meet, and obtains his ring again.

Still, in spite of these notions, the gold wedding ring is by no means an indispensable part of the marriage ceremony, for curtain rings, church keys, and rings made from gloves, or leather of any kind, have been used as a substitute.

Marrying with a rush ring was practised by designing men to deceive their mistresses, and on account of this abuse the practice is strictly prohibited by the constitutions of Richard, Bishop of Salisbury, in 1217.

"And whilst they sport and dance, the love-sick swains
 Compose rush rings and myrtleberry chains."

QUARLES' "Shepherd's Oracles," 1646.

In Greene's "Menaphon" is the following reference to rush rings:—"Twas a good world when such simplicitie was used, saye the olde women of our time, when a ring of a rush would tye as much love together as a gimmel of gold;" and Douce refers Shakspeare's expression, "Tib's rush for Tom's forefinger," to this custom.

There is another ring which is not so well known now, but which was pretty common in the fourteenth and fifteenth centuries. It was a frequent custom in the Middle Ages for widows to take a vow of chastity or perpetual widowhood, in token of which they received a peculiar robe and ring.

Eleanor, third daughter of King John, and widow of William Mareschal, Earl of Pembroke, made a vow of celibacy to Edmund, Archbishop of Canterbury, and Richard, Bishop of Chichester, after the death of her husband, and received the ring and mantle of profession in public. A few years subsequently she broke her vow and married Simon de Montfort, Earl of Leicester, not, however, before the strongest remonstrances had been made by the pious archbishop. The marriage was generally regarded as null and void, and it was only after the greatest exertions had been made for the pope's sanction, and vast sums of money had been spent, that a dispensation was obtained. In the will of Lady Alice West (1395) mention is made of "a ring with which I was espoused to God." In 1473 Katherine Rippelingham, "widow advowes," bequeaths "her gold ring with a diamante sette therein wherewith she was sacril." (To be continued.)

THE STEREOSCOPE.

THE stereoscope derives its name from two Greek words—*στερεόν* (stereon), a solid object, and *σκοπέω* (skopeo), I look at, inasmuch as the effect is such as to make the observer imagine that a really solid object (in the geometrical sense of the term), instead of a flat object, is placed before him.

Various optical combinations have been proposed and contrived for the purpose of producing this effect. In some the visual rays proceeding from the pictures are thrown into the requisite direction by reflection, and in others by refraction.

In the first form given to the instrument by Professor Wheatstone, its inventor, the visual rays proceeding from the two pictures were deflected by two plane reflectors placed at a right angle, so that in entering the eyes they proceeded as if they had diverged from a common point, at which the object represented by the pictures would, therefore, appear to be placed. In the lenticular stereoscope, invented by Sir David Brewster, the visual rays proceeding from the two pictures are deflected and made to diverge from the desired distance by means of two eccentric double convex lenses. One advantage of this arrangement is, that the convexity of the lenticular eye-pieces may be such as to produce any desired magnifying effect within practical limits upon the two pictures. The tubes containing the eye-glasses are made to draw in and out, so as to be adapted to different eyes, and are fixed by pins which pass into slits made in them in that position in which the deflected rays have the proper degree of divergence.

In the accompanying drawing (Figs. 1 and 2) are illustrations of the original Reflecting Stereoscope of Professor Wheatstone, Fig. 1 being a front view, and Fig. 2 a plan of the instrument.

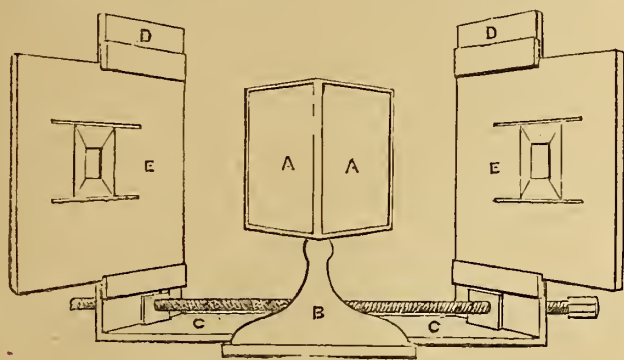


FIG. 1.

In his able paper, read before the Royal Society, the professor describes A A as two plane mirrors, about 4 inches square, inserted in frames, and so adjusted that their backs form an angle of 90° with each other; these mirrors are fixed by their common edge against an upright, B, or, which was less easy to represent in the drawing, against a middle line of a vertical board, cut away in such manner as to allow the eyes to be placed before two mirrors. C C are sliding boards, to which are attached the upright boards,

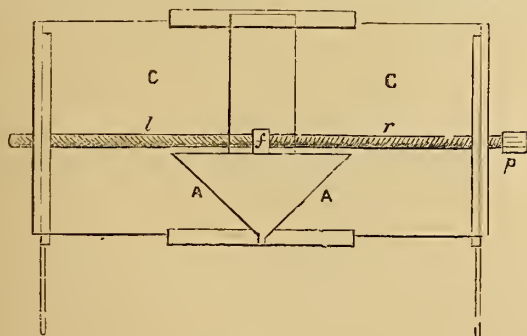


FIG. 2.

DD, which may thus be removed to different distances from the mirror. In most of the experiments hereafter to be detailed, it is necessary that each upright board shall be at the same distance from the mirror which is opposite to it. To facilitate this double adjustment are employed a right and left-handed wooden screw, *rl*; the two ends of this compound screw pass through the nuts, *ee*, which are fixed to the lower parts of the upright boards, DD, so that by turning the screw pin, *p*, one way the two boards will

approach, and, by turning it the other, they will recede from each other, one always preserving the same distance as the other from the middle line *f*. EE are panels to which the pictures are fixed in such manner that the corresponding horizontal lines shall be on the same level; these panels are capable of sliding backwards and forwards in grooves on the upright boards, DD. The apparatus having been described, it now remains to explain the manner of using it. The observer must place his eyes as near as possible to the mirrors, the right eye before the right-hand mirror, and the left eye before the left-hand mirror, and he must move the sliding panels, EE, to or from him, until the two reflected images coincide at the intersection of the optic axes and form an image of the same apparent magnitude as each of the component pictures. The pictures will, indeed, coincide when the sliding panels are in a variety of different positions, and consequently when viewed under different inclinations of the optic axes; but there is only one position in which the binocular image will be immediately seen single, of its proper magnitude, and without fatigue to the eyes, because in this position only the ordinary relations between the magnitude of the pictures on the retinae, the inclination of the optic axes, and the adaptation of the eye to distinct vision at different distances are preserved. In all the experiments detailed in the present memoir, these relations are supposed to remain undisturbed, and the optic axes to converge about 6 or 8 inches before the eyes. If the pictures are all drawn to be seen with the same inclination of the optic axes, the apparatus may be simplified by omitting the screw, *rl*, and fixing the upright boards, DD, at the proper distances. The sliding panels may also be dispensed with, and the drawings themselves be made to slide in the grooves.

This form of the instrument being now obsolete, we show, in Fig. 3, another style of the stereoscope in general use, and in which the observer looks directly at the drawings instead of at their reflected images, the two being made to coalesce by the introduction of two prisms or semi-lenses into the eye-pieces of the instrument. This form possesses the advantages of cheapness and portability, but can only be used with small drawings, and does not admit of the same amount of adjustment as the reflecting stereoscope.

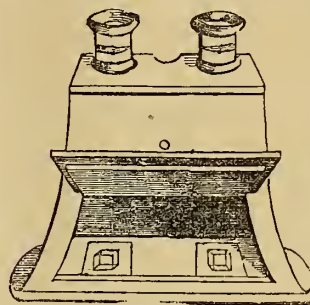


FIG. 3.

In Willat's "Scientific Manual," from which we have extracted, will be found a detailed description of the stereoscope and the manner of taking pictures suited for it, as well as copious extracts from the able paper of Professor Wheatstone, already referred to. According to such authority, "it is rigorously true, that the surprise and admiration excited by the stereoscope does not arise from the truth of the picture which it presents, but from the strong exaggeration of perspective and relief which it exhibits. It is very true," says that author, "that no art of the draughtsman or painter could produce such effects, but it is equally true that no such effects could be produced by the objects themselves."

(To be continued.)

NEW SNOW SPECTACLES.

MR. WILLIAM WHITE COOPER, oculist, has devised a new kind of spectacles to prevent snow blindness. It is well known that a long exposure to the intense white of the snow in the polar regions is most harmful to the sight; to meet this difficulty, spectacles of green-tinted glass, surrounded by gauze, have been proposed. These will, however, fail in practice, as the glass part of the spectacles is liable to get dim and cloudy, while the gauze and the wire, by means of which the spectacles are fastened behind the ears, will in an arctic climate become so cold that to the human skin they will have the sensation of being made of red-hot wire. Mr. Cooper's snow spectacles have neither glass nor iron in their composition, for they are made of ebonite, and are tied on to the head by a velvet cord. They resemble somewhat two half walnut shells fastened over the eyes. Their great peculiarity, however, is that the wearer sees through a simple slit in front of the pupil of the eye.

The sides of each eye box are perforated with minute holes, in order that the wearer can get a side view of objects. These glasses will also prove useful to travellers by railway, inasmuch as they keep out the glare of the sun and prevent the admission of dust into the eye. To engine drivers, therefore, they would be invaluable, especially when exposed during sleet, snow-storms, or windy weather. They are also agreeable when reading at night by lamp or gas light

BEAUMARCHAIS.

THIS extraordinary man, whose real name was Pierre Augustin Carou, was born in 1732. His father was a watchmaker of the Quartier Latin, and he was the only boy of six children. He was brought up to the paternal calling, for which, in his early years, he seems to have had but little taste, and to have been much neglected for music, of which he was passionately fond.

Of the education he received we have very little means of judging; it could not have been very liberal, but he spared no labour, in after years, to make up for its deficiencies. At this period, however, when the almost oriental lines of caste, which had obtained under the Grande Monarchie, were being broken down by the freer manners of the court of his successor, and class was gradually blending with class, not only by association, but by marriage, the Parisian *bourgeois* was making rapid strides both in education and refinement, and in these respects was equal, if not superior, to his descendants of a century later. Thus we find the elder Carou to have been a man of some cultivation. Two of the sisters were remarkable for taste, wit, and educated intelligence; one was a very fine musician, the other, Julie, who retired later in life into a convent, is not unknown in literature. Thus we find that the early youth of the future author of "Figaro" was passed in an atmosphere, and among associations, more genial than his birth might lead us to suppose.

Young Pierre was decidedly precocious, and a sad scapegrace, and probably sat to himself thereafter for the portrait of *Cherubino*. At thirteen he was in love with a girl several years older than himself, and, when she laughed at him, meditated upon the desirability of suicide. Two or three years later his father expelled him from home on account of irregularities of conduct, taking care, however, first of all that he should find a safe shelter beneath the roof of a near relative, whence the prodigal wrote very penitent letters, to which the father replied by an offer of reconciliation upon certain conditions, which reveal the nature of the offences. Among others, were that no orders were to be taken or executed in the business without his knowledge and authority, a condition which points to speculations; that he was to rise at six, and work till supper-time, against which we may write predisposition to idleness; that he was not to go out pleasuring except on Sundays, and then only among his immediate relations and friends, and that he was always to be home by nine at the latest—upon which we comment, love of late hours and indefinite company; and that the only time he should give up to music was that between supper and bed-time. Rather rigorous conditions these, would think apprentices of the present day. Nevertheless the culprit assented to them all, and, benefiting by the lesson he had received, applied himself so diligently to his trade, that at twenty he invented a new system of escapement, which proved to be a very valuable improvement in watchmaking. His discovery, published in a number of the *Mercur*, 1753, was impudently appropriated by Lepante, watchmaker to the Luxembourg, who trusted for impunity to the obscurity of the inventor. But little did he know Pierre Caron, who at once commenced a law suit against him, the first of many, for his life was one long series of litigations, one of which extended fifty years beyond it. The Academy of Sciences, before which the question was brought, decided in his favour. This affair made some noise in Paris, and even attracted the attention of the court. The king ordered one of the new watches, and Caron presented to Madame de Pompadour a tiny watch, of exquisite make, set in a ring; after this he was employed by all the courtiers, and took the name of the "King's Watchmaker."

"As soon as Beaumarchais appeared at Versailles," writes a contemporary, "the women were struck with his lofty stature, his slender, elegant figure, the regularity of his features, his bright, animated complexion, his confident bearing, that air of command which seemed to raise him above all who surrounded him, and finally with that involuntary ardour which he exhibited on their appearance."

One day a very handsome lady, about thirty, brought a watch to the shop to be repaired. A glance gave him his cue; he requested and obtained permission to be himself the bearer when it was finished. The lady was the wife of M. Francquet, a clerk of the royal kitchen, who was very old and infirm. She conceived a violent passion for the young watchmaker, and the husband seems to have made no objection to the close intimacy that ensued; indeed, so complaisant was he that a few months afterwards he made over to him his office, in consideration of an annuity, and, to complete the obligation, died soon afterwards.

Within eleven months of the demise of M. Francquet young Caron espoused the widow and assumed the title of De Beaumarchais, from a fief supposed to belong to her—a fief which, it is probable, existed only in his imagination. She survived her

second nuptials scarcely a twelvemonth, and, having neglected to register the marriage contract, he lost all her property. Those musical studies, which his father had so rigorously restrained, now stood him in good stead, and were the means of his first real advancement. Besides being a very fine performer upon the harp, an instrument then scarcely known in France, he had made some improvements in its construction. His success was so great that Louis' four maiden sisters desired to have 'a taste of his quality,' and in a short time he became their musical instructor; but not for hire, he soared too high for that. Such was the favour and familiarity he now enjoyed at court that on one occasion, every chair being occupied when he entered the music-room, so eager was the king to hear him that he pushed his own seat towards him and insisted upon his taking it. He even won the good opinion of the not too sociable Dauphin, who paid him the high compliment of saying, "He is the only man who speaks the truth to me."

That such favours should slightly intoxicate a young *bourgeois*, and inflate him with exaggerated notions of his merit, is not at all surprising. Nature had created him something of a coxcomb, and such associations were not calculated to correct that tendency. These failings and jealousy of his sudden rise, made him many enemies among the courtiers, who took frequent opportunities of mortifying and insulting him. One day a young noble requested him to examine his watch which he asserted was out of order. "Since I have left off the business I have become very unskilful in it," replied Beaumarchais, coolly. "You will not refuse me this favour," persisted his tormentor. Beaumarchais took it, held it up as high as he could on pretence of examining it, and then let it fall. "I warned you, monsieur, of my unskilfulness," he said, with a low bow, and passed on.

His influence with "mesdames" enabled him to confer a favour upon a person whose gratitude laid the foundation of his future colossal fortune. Paris du Verney, the celebrated financier, had just erected the Ecole Militaire, but the building and its purposes having been designed by Pompadour, who, since the beginning of the seven years' war, had fallen into disfavour, was looked coldly upon by the royal family, and during nine years he had vainly entreated a royal inspection of his work, which languished for the want of such patronage; he was now a very old man, and this visit had become the most desirable object of his life. It is a striking proof of the consideration in which Beaumarchais was held at the time when we find so rich and noted a man as Du Verney applying to him to bring about the accomplishment of his wishes. And he had not mistaken his man; in a short time the clever young courtier prevailed upon the king's sisters to visit the *ecole*, and soon afterwards the king himself followed their example. As a reward for this service Du Verney gave him a share in a speculation to the amount of 60,000 francs, and thus commenced a connection which brought much wealth to Beaumarchais, and which was dissolved only by the death of his patron—*Temple Bar*.

L I F E.

The following inscription is from Greyfriars churchyard.

Our life is but a winter's day,
Some only breakfast, and away;
Others to dinner stay
And are full fed;
The oldest man but sups
And goes to bed.
Large is his debt
That lingers out the day,
He that goes soonest
Has the least to pay.

WE are in receipt of the first three numbers of the *Canadian Masonic News*, edited by Bro. Rev. E. M. Myers, P.M., P.J.P.P.G.C., R.S., whose name and fame in masonry is sufficient guarantee of its editorial claims, whilst we recognize the "clippings" from works of equal merit. The work having in its aim—

"To make men just in their station,
Contains naught but what's good
To be understood
By every enlightened Free Mason."

WE are indebted to the *New York Jeweller's Circular*, *The Jewish Chronicle*, and several other journals, for kind notices and good wishes, for which encomiums they will please accept our best thanks.

PRECIOUS STONES.

GENERAL OBSERVATIONS (continued from page 35.)

Brightness, Colour, and Transparency.—Gems acquire more or less brightness, lively, varied colouring, and transparency in proportion to their single or double refraction, and to the polarization of light. The brightness of gems may be distinguished as follows:—

1. *Adamantine brightness.* That which gives out the splendour peculiar to the diamond.
2. *Vitreous brightness.* That which resembles glass.
3. *Resinous brightness.* That which shines as if the surface had been rubbed with oil.
4. *Pearly brightness.* That which resembles the particular light of a pearl.

5. *Silky brightness.* That which gives the appearance of silk stuff. The value of a gem depends principally on the beauty of its colour. The colouring material is generally composed of metallic oxides. The wonderful variety of colours in the gems, which more than all others resemble those of the solar spectrum, gave rise to the diversity of names which are often given to the same substance. The red corundum is the Oriental ruby; the blue corundum is the Oriental sapphire; the yellow corundum is the Oriental topaz; the blueish-green emerald is now called beryl-quartz, has many names, and more or less value in its different colours. There are crystals which not only have a varied gradation of the same colour, but also present three distinct colours. We have seen quartz in which the central disc is red surrounded by a green zone, ending in a white band. Corundums have been seen in which shone red, blue, and yellow; and we sometimes see the tormaline variously coloured, watered, and marked with strange figures.

In some gems the colour differs according to the reflection or transmission of light. The opal, with reflected light, is prismatic; and with transmitted light it is whitish. The tormaline, with reflected light, is red, blue, or some other equally bright colour; but with transmitted light it is olive. Many crystals present beautiful changes of light when this is reflected in certain given directions, as in the Labradors, the moon-stone, and the asteria. Minute crevices cause the iridescence, as in the stone called iris. Many gems are more or less transparent—that is, they possess in a greater or less degree the power of transmitting light; and, according to these degrees, they have different denominations. That stone is called “transparent” which when placed before an object does not impede its view. When the stone allows an object to be seen indistinctly through it, it is called “semi-transparent;” and “translucent” when it allows the light to pass, but hinders the view of objects.

Electricity is produced in gems by heat, friction, or violence. In some gems it is caused by warming them at the fire, and then they are said to possess pyroelectricism. Electricity is produced by friction in the topaz, the amethyst, all quartz, the diamond, the garnet, and emerald. Some crystals become electrical by percussion, as, for instance, the Iceland spar. Some stones conduct, others reject electricity, which in those cases is either positive or negative. The power of retaining electricity, when produced, is very variable in stones, and the time which elapses before they lose it forms a valuable mark of distinction amongst them. The Indians have for a long time been aware of this property peculiar of gems. The celebrated Häüy speaks of it at great length, while describing many instruments used by him to certify the phenomenon.

Fusion and Solution.—The facility or difficulty experienced in melting or dissolving a gem serves to indicate the elements of which it is composed. The diamond alone will not dissolve, although it is combustible. All the corundums can be dissolved by means of borax, but with great difficulty; the emerald, the jargon, and the spinel, more easily. Caloric produces very different effects on other gems: some change colour, others swell and crackle, and many others burn, are changed into vitreous globules, into a kind of cement, into a powder; and in some others phosphorescence is produced. Many other precious stones besides the diamond are incapable of injury by acids; amongst these are the corundum and the spinel. Not a few change colour in acids, as, for example, the German agate.

(To be continued.)

BOOKS AND MAGAZINES RECEIVED.—“A Treatise on Watch-work, Past and Present,” by Rev. H. L. Nelthropp, M.A., F.S.A., E. & F. Spoon, London and New York (to be reviewed in our next).

“The Encyclopædic Catalogue of Mathematical, Philosophical, Optical, Photographic, and Standard Meteorological Instruments,” Negretti and Zambra, Holborn Viaduct.

The New York “Jewellers’ Circular,” for August.

“The Scientific American Horological Journal,” for September; and other usual monthlies.

THE DIAMOND.

(Continued from page 35.)

THE origin and mode of formation of the diamond is, however, a question still involved in doubt and obscurity, and this is increased by the singular fact that it has never yet been found in its original bed or native matrix. The ruby, the sapphire, the emerald, the topaz, the hyacinth, and, in fact, every other crystalline mineral known has been found imbedded in some vein-stone or rock, where it was evidently formed; and if we find these gems in sand or gravel, as is the case in India or in Brazil, we have no doubt that they come from the wearing down of these rocks—a process which the harder crystals have escaped, though often not without a partial abrasion of their surfaces. The most diligent search has, however, failed to detect the diamond in any such rock. The well-known desire of mineralogists and geologists to get some clue to the original associations of the diamonds has even stimulated fraud, and diamonds have been ingeniously cemented into cavities among crystals of quartz in such manner as to suggest that the original matrix of the gem had been discovered. In a specimen of this kind from Brazil, the application of a solvent showed that the diamonds were only held in their place by some artificial cement, and the precious specimen was at once deprived of its scientific value.

A year or two since mineralogists were, therefore, greatly gratified to hear that a Russian mineralogist, Von Jeremejew, had solved the problem. It is well-known that diamonds are found in the sands of the Urals, and this observer declared that he had found the matrix of the gem in the mineral known as xanthophyllite, a crystalline foliated mica-like silicate, which is found in that region, and which he declared to be full of microscopic diamonds. There was nothing at first sight improbable in this. Crystals of imbedded minerals are by no means uncommon. Thus the mica of Haddam, Connecticut, sometimes encloses small and beautiful crystals of garnet, and elsewhere tormaline crystals are found similarly imbedded. Small specimens of the precious mineral were distributed among mineralogists, mounted on slides for the microscope, and the writer was permitted to feast his eyes upon what, under a high magnifying power, seemed to be numerous well-defined and brilliant crystals of diamond, imbedded in the transparent xanthophyllite. But alas! for the delusions of the microscope when in unskilled hands or when looked into only by uncritical eyes. We have known minute air-bubbles to be mistaken for entozoa by too credulous physiologists, who anxiously sought the latter by the aid of the instrument; and we are now informed that the minute diamonds of Von Jeremejew are not more substantial. Prof. Knop, who has lately submitted the supposed diamond-bearing xanthophyllite of the Urals to a chemical and microscopical examination, asserts that they have no existence, and that the forms supposed to be diamonds are small empty cavities in the mineral, from which previously existing crystals of some other substance than diamond has been removed by solution; and he has moreover succeeded in producing the same appearance by submitting what seemed homogeneous portions of the mineral to the action of an acid, which removed the imbedded and soluble crystals.

The diamonds of all parts of the world are, as is well known, found in gravel or sand, sometimes recemented into a rocky mass. But they are associated with various other crystalline minerals—such as tormaline, etc.—evidently derived from the ruins of crystalline rocks; and we may confidently expect that sooner or later the true matrix of the diamond will be found in a crystalline rock. It should be said that although diamonds have been found in Brazil imbedded in a micaceous sandstone, this is regarded as only a reformed and cemented rock.

THE New York *Jewellers’ Circular* for August is to hand, and, as usual, contains a variety of instructive and interesting matter, reflecting considerable credit on its publishers. Our American cousin is, however, mistaken in the impression that the excellent articles which we reproduced from its pages were not duly acknowledged, since such acknowledgment was made at the commencement of the articles alluded to, and not deemed necessary when the same were continued from number to number. For good wishes the *Jewellers’ Circular* will accept our best thanks and reciprocation.

EXPERIMENT shows that 1 per cent. or less of phosphorus so far modifies cast iron that it will resist the action of concentrated sulphuric acid to a greater degree than when entirely free from phosphorus; and those who separate silver and gold by the sulphuric acid process find that some cast-iron vessels are destroyed in a few weeks, while others will last for years.

RARE WORKMANSHIP IN RINGS.

THE accompanying engravings represent part of the testimonial presented to Dr. E. Harold Browne on the occasion of his being translated from the bishopric of Ely to the see of Winchester, when a subscription to a very considerable amount was raised, among the clergy and laity of the former diocese, for the purpose of presenting his lordship with some object or objects that would testify to the personal regard entertained towards him and the high appreciation of his labours.

The testimonial ultimately took three forms: one, a portrait of the bishop, and presented to Mrs. Browne; another, a costly dessert service; and lastly, two massive episcopal rings, of rare and exquisite workmanship and design, and which are represented in the accompanying engravings, reproduced from the *Art Journal*.



The large oval ring—three separate views of which are here produced—consists of a magnificent sapphire mounted in gold; on one side appears a minute, but well-modelled, figure of St. Swithin, the first Bishop of Winchester; and on the other side is that of St. Etheldreda, Abbess of Ely: both figures are sunk in concaves.

The other ring, with the vesica-formed bloodstone, shows the arms of the see of Winchester quartered with those of the new bishop; on the sides respectively are sculptured in relief the letters *alpha* and *omega*. Both rings were designed and executed by Mr. John Brogden, Henrietta-street, Covent-garden; and whilst engravings exemplify the taste displayed in the designs, the skill of the workmen engaged in producing them is a matter which reflects the highest credit on all parties engaged in their manufacture.

THE SICKER SAFE AND STRONG-ROOM COMPANY, LIMITED.

THE first general meeting of this Company was held at the Great Western Hotel, Birmingham, on the 27th ult.

The Chairman, Mr. G. J. Smith, presented a very satisfactory report on the position of the Company, and announced that the Directors have leased, on most favourable terms, the extensive premises adjoining the Soho Station, on the London and North Western Railway, and which were formerly occupied as Messrs. Baines' Railway Turn Table Works. The premises are to be considerably enlarged and altered so as to adapt them to the requirements of the Company; and when finished are expected to form one of the largest and most complete safe manufactories in the kingdom.

The Chairman also stated that the Company had just completed an important contract for an Eastern Government and which is anticipated to lead to extensive and profitable results; and that there are on hand at present time, orders which will tax to the fullest extent the resources of the present works to execute. Among such contracts are a number of safes and strong-rooms on the *Sicker* principle, for some of the largest Banking Companies in the Midland counties, besides orders for bullion and jewellery establishments.

The report was adopted unanimously, and after the usual vote of thanks to the Chairman the meeting terminated.

USEFUL HINTS TO WATCHMAKERS AND JEWELLERS.

(Continued from page 38.)

RED ENAMEL.

NO. 1. Paste or flux coloured with the red oxide or protoxide of copper. Should the colour pass into the green or brown from the partial peroxidation of the copper, from the heat being raised too high, the red colour may be restored by the addition of any carbonaceous matter, as tallow or charecoal.

No. 2. By tinging the glass or flux with the oxide or salts of gold, or with the purple precipitate of cassius. These substances produce shades of red, inclining to crimson or purple of the most exquisite hue. The enamel often comes from the fire quite colourless, and afterward receives its rich hue at the lamp.

No. 3. *Wynn*. Sulphate of iron (calcined dark) 1 part, a mixture of 6 parts of flux (No. 5) and 1 of coleothar 3 parts. Dark red.

No. 4. *Wynn*. Red sulphate of iron 2 parts, flux (No. 1) 6 parts, white lead 3 parts. Light red.

ROSE-COLOURED ENAMEL.

Purple enamel (or its elements) 3 parts, flux 90 parts; mix and add silver leaf or oxide of silver 1 part, or less.

TRANSPARENT ENAMEL.

The frit or flux described above, without colouring matter.

VIOLET ENAMEL.

No. 1. Purple enamel 2 parts; red enamel (No. 2) 3 parts; frit 6 parts.

No. 2. Saline or alkaline frit or flux any quantity; peroxide of manganese, enough to colour. As the tint depends on the metal being at the maximum of oxidation, contact with oily or carbonaceous substances should be particularly avoided.

WHITE ENAMEL.

No. 1. Calcine (from 2 parts of tin and 1 part of lead) 1 part, fine crystal glass or frit 2 parts, manganese a few grains; powder, mix, melt, and pour the fused mass into clean water; again powder and fuse, and repeat the whole process three or four times, avoiding contamination with smoke, dirt, or oxide of iron. A fine dead white.

No. 2. Washed diaphoretic antimony 1 part, fine glass (free from lead) 3 parts; mix and proceed as before. Very fine.

No. 3. Lead 30 parts, tin 33 parts; calcine as before, then fuse 50 parts of this calcine with an equal weight of flints in powder and 100 parts of salt of tartar. A fine dead white enamel.

For white enamel the articles must be perfectly free from foreign admixture, as this would impart a colour. When well managed, either of the above forms will produce a paste that will rival the opal.

YELLOW ENAMEL.

Superior yellow enamels are less easily produced than those of most colours; they require very little flux, and that mostly of a metallic nature. The following come highly recommended by experienced artists:—

No. 1. From frit or flux, fuse with oxide of lead and a little red oxide of iron.

No. 2. Lead, tin ashes, litharge, antimony, and sand, of each 1 oz., nitre 4 oz.; mix, fuse, and powder, and add the product to flux or frit, enough to reduce the colour.

No. 3. White oxide of antimony, alum, and sal ammoniac, of each 1 part, pure carbonate of lead from 1 to 3 parts (all in powder); mix and expose them to a heat sufficiently high to decompose the sal ammoniac. Used as the last. Very bright coloured.

“PLEASURE is man's chief good; to enjoy reasonably is his wisdom and his duty; it is the great lesson of human life, but a lesson which few have learned, and none less than those who proclaim themselves masters of art in it.”—*Young*.

AMBITION is like a wild horse, which prances unceasingly until it has thrown off its rider.

A YOUNG LADY who had no time to spare in making garments for the poor, has been engaged three weeks embroidering a blanket for her poodle dog.

AMONG THE ELECTROPLATING.

WHEN VOLTA, in the closing year of the last century, instead of pursuing his investigations into the preventability of hail-storms, invented the Voltaic Pile, he little imagined what germs of entirely new industries he was giving to the world. And why it was called a "pile" we may as well state at once. The original instrument, shall we say, was composed of discs of zinc, silver and pasteboard, laid on, hand-over-hand, in the same order, to the extent of more than a hundred, until they formed a regular pillar, or pile, the uppermost one being silver. To the zinc plate at the bottom and the silver one at the top were attached two separate wires, and then was the battery made, with its positive and negative poles; or, to speak, perhaps, more correctly, all the phenomena of the ordinary electric battery could be produced.

Experimenting went on without much practical advancement until the late Professor DANIELL brought forth the Daniells, or "constant battery," as it has been called. That invention may be broadly taken as the practical commencement of electro-metallurgy. In 1801, the celebrated Dr. WOOLLASTON published, in the *Philosophical Transactions*, the following statement:—"If a piece of silver, in connection with a more positive metal, be put into a solution of copper, the silver is coated over with the copper, which coating will stand the operation of burnishing." But, notwithstanding what is here set forth, "electro-metallurgy," says Mr. Smee, "may be said to have had its origin in the discovery of the constant battery by Professor DANIELL." We have to mention that Mr. Smee himself is an electro-metallurgist of established reputation.

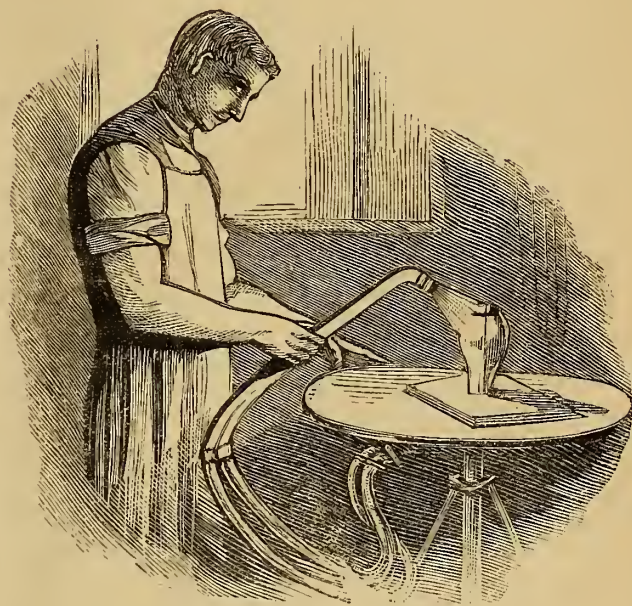
Not having space here to enter upon the scientific progress of the art, nor even to mention the names of the investigators—they are so numerous—we have to take our readers along the more commercially practical part of the work now under notice.

Having determined, if possible, upon inspecting the *modus operandi* of electroplating as a branch of manufacture, the next thing was to find the means of doing so. With a friend at court, which, as the old proverb tells us, is better than money in your purse, we got over the preliminary difficulty, and soon found ourselves on the high road to where we wanted to go. We may fairly presume that there are hundreds of tradesmen who are engaged in distributing electroplated articles among customers every day in the year who have, of necessity, from want of opportunity, a rather hazy notion of how it is all made. We will endeavour to tell them.

After passing through the inquisitive ordeal of the private counting-house, and having our limits of action much more circumscribed than we at first intended, we were duly given in charge and marched off. Our first visit was to the metal receiving room, where all the unwrought stores are kept. Here we saw the walls honey-combed with shelves, pigeon-holes, drawers, &c., all laden and occupied; whilst the floor, too, was covered with "goods," just as they had been delivered from the flattening-mill and the foundry. There were rolls of sheet metal, varying from 8 inches to 20 inches in width; here whole regiments of plates for the fashioning of those gigantic haunch-of-venison dishes that one sees occasionally at grand imperial and civic banquets; there, wire of all gauges for bordering and other ornament. Some in the solid was twisted to resemble a rope, whilst other portions were partially prepared for that which they would ultimately assume. Then, again, there were castings of every imaginable—ay, and unimaginable pattern, too. Huge stamping dies were methodically arranged in "most admired disorder;" indeed so methodically, that they suggested the idea of a new kind of oddly-sided shot for as oddly-bored guns. We expressed the confusion of ideas produced by what we saw around us, but we were told that, notwithstanding appearances, whatever was wanted by any department could be easily and hastily found, almost in the dark, by the person requiring it. After that statement we speedily concluded that the receiving store was no place for the uninitiated, and, fancying that some of the weightier articles were moving uneasily towards where we were standing, we made a sign that it would be agreeable to us to take our departure and leave them quietly to themselves; the door was unlocked and we breathed the air of liberty again.

The next place we entered was a large workshop in which the various operations of stamping, soldering, and "fitting" were being carried on. The first thing that attracted our attention was the stamping work. This is, as may be inferred, of every kind and degree for which such an operation is practicable. The rapidity with which this kind of work is done forms an important element in the economy of production. The stamped pieces are passed on to the next operation. Supposing the form to be the plinth of a candelabra, or the branches, then they go to the candlestick-maker,

who "mitres and wires" the pieces very carefully together and gets them ready for soldering. To those who have never seen soldering done in the "wholesale" way in which the electroplater does it, it is very interesting, as it is quite plain that a considerable amount of practice is required for the more delicate part of the work. What is more, when the article is ready for the purchaser, the keenest of keen eyes would not be able to find the seams of this soldering. It is done in a somewhat different way from that in which "Tom, the tinker," puts on an old teapot lid; here it is. The article is placed on a charcoal hearth upon a revolving iron table, as represented in the accompanying drawing, and the work-



man, by means of a fan-fed blowpipe specially arranged, turns the flame upon the joint, adding the solder, until a complete surface fusion takes place and the junction is complete. Considerable care and experience are required at this work to prevent mishaps.

Dishes and plates, and many other articles, are stamped out of the thicker metal, after which the ornamental edging, filled with brass underneath, the better to stand wear and tear, are soldered on in sections. Then follows "flat-hammering," or "planishing," to obtain a perfectly level surface of the central part; this is succeeded by "repairing," or "riffling," to bring out sharply the ornamental work, &c., which is so much admired in such articles. "Riffling" is done by small hand tools, called "rifflers," in something like this way. Suppose that the edge, or "mounting," as it is technically termed, of a dish was a rope, or a chain-cable, then the workman, with the point and edge of his "rifle," cleans out every twist, and bend, and link, until the whole design is brought up in prominent relief to the eye. The same is done with foliage, tracery, "fretwork," more commonly speaking, "network," &c. In the latter kind of ornamentation, however, such as we see in liquor, cruet, and other frames, fruit-stands, &c., the operation is called "pierce-working," which carries with it its own meaning. The last processes before plating are "buffing," and chasing, and engraving. When these have been done to satisfaction, the article has to be chemically cleaned, to free it from grease and all other impurities, so as to fit it for the plating-bath, of which we will now speak. We cannot here enter into the history of electro-metallurgy from the discoveries of BRUGNATELLI, WOOLLASTON, and DANIELL, in the beginning of this century, until its development as a national industry, our immediate purpose being more practical, but we believe that, in the present day, no two methods are precisely alike in detail.

In preparing the bath the general principle is, first of all, to dissolve the apportioned quantity of silver in nitric acid; then the acid is carefully washed out, cyanide of potassium is added; and when the mixture has been properly prepared, it becomes the plating solution. The articles, having been, as already mentioned, chemically washed, are then placed in suspension by wires from a rod connected with the negative pole of the battery, when deposition immediately commences. It is very interesting to see a row

of forks, or spoons, or, say, a tea-urn, a family of tankards, the members of a large centre-piece, enormous venison dishes, &c., quietly lowered into the bath, and other articles, which have had their turn therein, as quietly taken out, beautifully covered with silver. Any thickness can be deposited. All the articles that we saw were best German silver, and on account of that would not show the wear by any means so soon as the old method of plating upon copper or iron. Everybody has heard of "Sheffield plate," but very few persons know how it was made. Well, it was in this way:—

An ingot of copper was cast the required size, and upon it was laid a similar piece of silver. They were fastened with wire, and heated up to nearly melting-point in the furnace; then they were passed through rollers, according to the gauge required, and converted into plates. From these plates the articles were afterwards made. All ornamental work or "mounting" had to be stamped out and fastened on with soft solder, so that the best of them had very little holding power. All ornaments, feet, handles, figured work, &c., were fashioned much in the same way, filled with lead and tin, soldered together, and with the same soft solder stuck on to the main body of the article. Candlesticks were filled with resin, pitch, or whatever would answer the same purpose. Spoons and forks were made of iron, and the silver soldered on. It is quite clear that, under such circumstances, only soft solder could be used for "mounting;" hence the breaking off of the ornaments of Sheffield-plated goods was always an alarming fact, as many a good housewife knew to her temper and her cost.

Let us now look at the advantages of electroplating when done in an honest, substantial manner.

In the first place, for best-quality goods nothing but hard white metal is used, itself capable of taking a high polish. When in its normal state, that is, as it comes from the store, it is formed into whatever is required. The joints are closed, and the work put together with what is termed hard silver solder, by means of the action of the blow-pipe. Under these conditions the seaming and jointing all through are the strongest parts of the pieces in hand. Thus, contrary to the obsolete Sheffield process of plating beforehand and then making the article, the electroist makes *first* and plates *afterwards*. The saving of waste and labour by the change can be readily understood; indeed, the economy, both in regard to cost and excellence, cannot be too strongly impressed upon the public mind. Furthermore, with respect to complex, delicate ornamentation—the fairy-fingered work of our plate-service—the electro-metallurgist is not compelled, as in bygone days, to rely exclusively on steel dies, his resources go far beyond. He can model what he listeth, cast from his model, and silver and adorn afterwards—even to the embodiment of the Shakesperian brain-created Queen Mab—

"In shape no bigger than an agate stone
On the forefinger of an alderman,
Drawn with a team of little atomies
Athwart men's noses as they lie asleep;
Her wagon spokes made of long spinners' legs,
The cover of the wings of grasshoppers;
Her traces of the smallest spider's web;
Her collars of the moonshine's watery beams;
Her whip of cricket's bone; the lash of film;
Her wagoner a small grey-coated gnat,
Not half so big as a round little worm
Prick'd from the lazy finger of a maid;
Her chariot is an empty hazel nut,
Made by the joiner squirrel, or old grub,
Time out o' mind the fairies' coachmakers."

The final stages are "burnishing" and "finishing." The "finishing" consists in submitting the plated article to the action of "bobs," or small leather discs, fed by finely-powdered lime, and revolving so rapidly as to be seen almost motionless on horizontal spindles. After this operation they are "coloured" with the naked hand and rouge. Burnishing, as its name implies, carries its own meaning with it, and needs little further explanation.

Forks and spoons are struck in dies from the sheets, filed up, prong-pointed, and prepared for plating in the usual way. "Spoon-work," which, by-the-by, includes forkwork as well, is not burnished, but "finished;" the same may be said of engraved and some other kinds of goods. The burnishers, by the way, are always ladies, and, from what hasty, askant views we were enabled to take, we should say very cheerful and pleasant-looking ladies, too. They have nice, upstairs, well-lighted rooms to work in, and of them it may be charmingly said, that they live all day long amid a profusion of glittering wealth. Still, when at home, the handling of plain steel three-prongers and common crockery must be a kind of

relief to them; much like what looking in at shop windows upon the shining products of their nimble fingers is a pleasure to ourselves. The burnisher works with quite a family of tools tipped with blood-stone, and steel, fixed in little handles, to enable her to brighten up every hole, corner, and crevice, of what she is engaged upon. And then the Show Room. By the time that the work of the burnisher and the finisher have reached the "Show Room," that work has both the look and the ring of sterling silver.

Before we enter there, however, we will just mention that there is a "model-room." In that room models are made, and models are broken; others are preserved and duly "booked." Here a regular registry is kept, and, should any design not in stock be required, the "Registry" is consulted, the particular "lost one" unearthed and handed over for reproduction at once, without any trouble whatever. On the walls are placed facsimiles of designs in chasing and engraving, all numbered and entered in the "duty-roster." From the model-room we passed into the next room, and the appearance was so singular that we could scarcely realize for the moment where we were. The technical name is "The Hospital," a name which our readers will have no difficulty in understanding. It virtually consists of the "maimed," the "halt," and we might almost say the "blind." In cases, and on tables and floor, are examples of every article shaped, or silvered, in the works, in a state of "casualty." Centre-piece palm-trees lopped of their foliage, and forsaken camels standing by the bare, and sometimes branchless trunks; wine-coolers that certainly will not hold water; grand candelabra, without the ghost of a place for a single candle; flower vases into which flowers could never be put; decanter frames, that look as if they had been born and bred of the marine-store's darkest slum, to say nothing of the thousand-and-one crowds of rank and file, all disabled and useless; in other words, not to be too enigmatical, the "hospital" is the place in which all articles are kept in a partial condition of forwardness, awaiting their turn to be fully equipped and turned out for immediate duty.

Whilst we are here we may mention that another great advantage of electroplating is to be found in the fact that all the old, worn Sheffield-plated goods can be passed through the silver bath and thoroughly revived, without in the slightest degree interfering with their ornaments or engraving. This must be of great benefit to persons who have probably inherited plated services on the old plan, and which, from the wear of, it may be, generations, the silvering have become so dilapidated as to prevent its reappearance upon the table. We may add that electro-gilding is as easily done as the plating. We saw a number of things that were awaiting their turn for a "new lease of life."

From the hospital we passed into the "glass-room," where we seemed to have taken leave of the metallic and entered the crystal world. Here were whole batteries of dismantled claret jugs and brandy decanters; full battalions of newly-recruited sugar-basins, cream-ewers, butter-dishes, ice-buckets, "pickles," and cruets, all ready to be called to the front for "mounting" and service at a moment's notice. Having duly inspected these extensive "reserves," we wended our way to—

THE SHOW ROOM.—This apartment, like all similar places, is filled with glass cases containing the multifarious products of the manufactory, from a salt-spoon to a tea-urn; and from the tiniest of platters up to the great Gog-Magog channelled and welled venison dishes that have been already mentioned. It would be a hopeless task to enumerate a collection of goods that requires a separate catalogue of its own.

Nor can we say to the reader, "Go and see;" for the simple reason that we were only there on sufferance ourselves, upon a duly accredited introduction; nevertheless, *present your card and try*. The establishment is a manufactory pure and simple, and consequently its doors are only open to those who are commercially engaged between the manufacturer and the general public in the distribution of these particular wares.

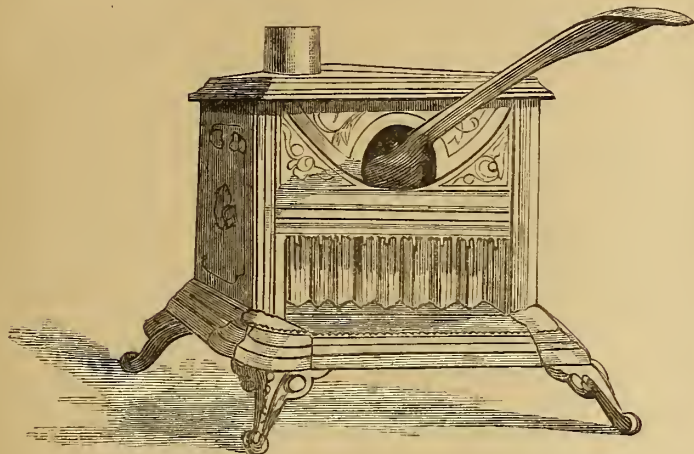
Upon looking round the Show Room, however, our eyes rested on three "notions" which we cannot forbear describing. These were a brandy-and-soda frame, a spoon-warmer, and a table—we will not spoil the "deal" by telling what this is now.

The brandy-and-soda frame is a very handy arrangement. On each side is placed a bottle of soda-water, at each end a glass, and the brandy decanter in the centre. Should the same plan be desired for a larger party it can be easily carried out. As we have said, it is exceedingly handy and compact, and can be readily removed by a servant, either from the butler's pantry or the cellaret of the sideboard.

The next article is one that, considering the oddity of the design and its novel application, will be sure to provoke much mirth round whatever dining-table it is seen upon; we understand that it has

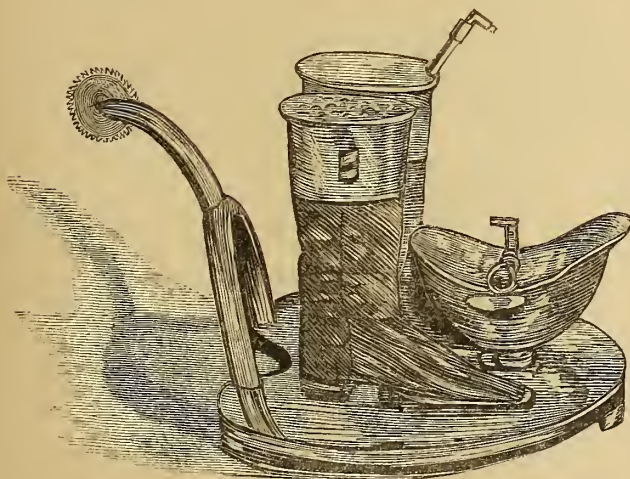
barely reached the outside public as yet, that is the "spoon-warmer."

The design is an American cottage cooking-stove. First of all, boiling water is poured down the chimney until the receptacle is full, then you open over the fire-grate and put a gravy-spoon in. But the spoon is not touched by the water; the water surrounds this spoon oven, and so effective is the action that, on a dining-room table, the spoon would keep up to blistering heat for hours. It is the greatest novelty of its kind that we ever saw, and, besides being a comical ornament to the table, is exceedingly useful, and will be sure to become very popular.



The above illustration is merely a front view, in order to show the gravy-spoon in place, the full dimensions being about 7 inches long, 5 inches broad, and $4\frac{3}{4}$ inches high. The square portion of this new silver-spoon-hot-water oven is somewhat smaller than the measurements here given, as we included the length and breadth of the hearth part, and the length of the four little legs. It is very unique.

The third article is the table—what d'y'e call it?—that we mentioned just now. It consists of a horse-shoe silvered plate as a stand filling up the centre. From the ends of the shoe rise a hunting spur, rowel, and all complete. Upon the plate are a pair of hunting-boots, whilst in front is a hunting-cap laid upon its crown. Out of one of the boots may be seen the handle of a hunting-crop, or whip, and out of the cap another one. Now, the secret is this. Upon lifting one of these whips you find—spirit of Dian—a gilt spoon! Yes, one boot is a "mustard," another a "pepper," whilst the cap is the "salt." The pretty little gilt bowls



are attached to the whips at the head of the lashes, whilst the latter are wound round their several handles. We were told that this laughable trifle—for laughable it is—has been so much appreciated that it has enjoyed a very extensive patronage. Such were the three novelties that attracted our attention.

Upon looking round we were agreeably, and we might add, artistically surprised to see a revival of the antique silver pattern for both candlesticks and candelabra, a pattern that is now so very much

admired, and that brings vividly before us the early part of the eighteenth century. Queen Anne, Godolphin, Admiral Rooke, and the capture of Gibraltar, Blenheim, Marlborough, Ramillies, the Union of England and Scotland, and many other great events. A steady current of public taste has been for some little time running in the direction of such work, and, judging from the signs before us, ample appliances have been called into requisition to provide for it. We saw many other things worthy of notice, which we must reluctantly pass by, but we will, however, say a word about—

That important personage, "the buyer," has just entered the room with one of the firm, and, as our presence may be embarrassing, we will quietly vanish.

Such is the story of our visit, plainly and briefly told, and we hope that our readers have been entertained by it, possibly somewhat instructed.

The manufactory that we visited was that of Messrs. R. HODD & SON, of Hatton-garden. In order to prevent the slightest atom of misapprehension, we beg to state that the only thing they are responsible for here is that of allowing us to go over the works, examine the various processes, and ask a few questions. With this, we make our bow and take our leave, handing down to posterity what we saw AMONG THE ELECTROPLATING.

THE GOLDSMITH'S ART.

(Continued from page 27.)

WHILE Francia practised the goldsmith's art as well as painting in Bologna, says Vasari, the best of his numerous disciples was a young man called Marc' Antonio, originally a worker in niello, and now a more skilful designer than his master. Albert Durer had begun to publish his engravings on copper, and, seeing these, Marc' Antonio determined to give himself to the new art. He went to Rome; Raphael acknowledged his great power of easy and correct outline, took him into the army of his pupils, and, it is said, occasionally worked on the plates with him, making his own colour-grinder pull the impressions, that Marc' Antonio might not lose his time. This last circumstance shows us that the engraver in these golden days printed his own plates.

The engravings by Marc' Antonio are very numerous, and are principally from Raphael's pictures. They are certainly very inferior as engravings to the works of several contemporary German engravers, both in the incredible dexterity exhibited by those artists in execution and in the character expressed. Indeed, his copying, for sale in Italy, thirty of Durer's woodcut prints of the "Passion of Christ," and also nearly all the twenty called the "Life of the Virgin," is an acknowledgment of his own inferiority in design at least, as his affixing Durer's monogram was a proof of his dishonesty. Yet perhaps Raphael can never be so well rendered as he has been by Marc' Antonio's hand; and this superiority, coupled with the tradition of Raphael himself having worked on the plates, will always make the productions of M. Antonio historically important, although inferior to others then appearing. The best of all the early Italian engravers appears to me to be Andrea Mantegna, an artist of such trenchant skill that no technical difficulties could stand before him. His influence as a painter affected all the schools of Italy, which can scarcely be said of any other artist of the early or middle time. But it is not only in technical matters and knowledge of the antique that he is supremely distinguished, his poetic perceptions and his inventions are equally great.

After the first century of engraving in Italy, the prints issued became numerous beyond calculation, representing, for the most part poorly, all the pictures and decorations produced by the great artists.* But of later engravers in Italy it is not necessary to speak, except, perhaps, to mention Raphael Morghen, whose restoration on copper of Da Vinci's "Last Supper" has made the world better acquainted with that great work than any other means could have effected.

(To be continued.)

THE GOLDSMITHS' COMPANY have given a donation of 100*l.* to the council of the Charity Organization Society.

* Hundreds of these old plates were bought by a dealer in Rome and reprinted with his name and date on them, Carlo Losi, 1773-74, rather puzzling the uninitiated. It was the same with another dealer, Salamanco, whose imprint, "Ant. Sala. Ex.," is a sure mark of inferiority in the impression.

THE

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The attention of our readers, and the trade generally, is called to the form of subscription order, which will be found on page 64. When two or more copies are forwarded to one address, or in instances of subscription clubs being formed so that the copies for such club are sent to one person, a discount of 10 per cent. will be allowed from the regular subscription rates, but in no instance will such deduction be made for subscriptions of less than one year.

OUR ILLUSTRATED SUPPLEMENT.

WE have the pleasure of again presenting our readers with an illustrated supplement, shewing designs of jewellers' and goldsmiths' art-work in Syria and Palestine. The articles of illustration are alluded to by Mrs. Mary Eliza Rogers in her able article on art-work in Syria and Palestine.

The necklace, of which a full-size representation is given in Fig. 1, is of very pure gold, and is an especially characteristic example of Syrian design and workmanship. It was purchased by our friend Professor T. L. Donaldson, at Jerusalem, in the year 1868.

It is a very ancient pattern, but is being constantly reproduced with variations in detail and combination.

The central jewelled ornament projects about one-third of an inch. The middle stone looks like a carbuncle, but it is a rounded ruby, for rubies are very rarely cut into facets in Syria. The surrounding stones are of a pale green colour, and very rudely cut. From this centre-piece is suspended a little circular convex open-work ornament. It is very delicately and carefully wrought, with globules of gold so artistically arranged upon it to catch the light, that they produce almost as much effect as if pearls had been employed.

The cross which hangs from this rosette is of fine filigree-work, enriched with numerous globules of gold and five precious stones. The central stone is a smooth ruby, the four others are very poor pale green stones, badly cut and clumsily set. There is no attempt at accuracy or regularity in the workmanship of this cross, but it is well balanced and has a very rich and pleasant effect. Perhaps it would not look so well if reproduced with precision and mathematical exactness, though it might be greatly improved by having good and well-cut stones introduced into it.

The very freedom of Syrian filigree-work gives a pleasant impression; there is nothing monotonous in it, although the materials are so simple, being merely bands and slender ropes of gold carved into graceful lines, golden globules of different sizes, and little flat pieces of gold of various shapes to reflect light.

The illustration (Fig. 2) shows what rich effect may be produced by a skilful arrangement of a set of pendants. Mr. Rogers speaks of having seen this ornament in use by a lady at Baalbeck. She wore a red *tarbush*, which was almost concealed by folds and muslin, and violet-coloured crape. To this crape the glittering gold ornament was hooked, a little towards the left side of her head, and on the other side bunches of yellow everlasting flowers and diamond ornaments were fixed.

It will be seen that the pendants, which are embossed and chased, are threaded at regular intervals and divided by gold beads and tubes. The little ornaments at each end, which conceal the sharp hooks, are set with turquoises. Similar designs are spoken of, in which instances the pendants were pierced, and divided by small pearls, while the hooks were mounted on triangular finials set with large pearls.

Fig. 3 represents a small pendant worn by a child in the East, and sewn to his *tarbush*. The resemblance of the centre to the palm of a hand will easily be traced. In this palm will be noticed a double triangle neatly embossed, and seven points representing the seven planets. A little model of an open hand is regarded as a potent charm against the evil eye in Syria, and even in Italy the same idea prevails among the uneducated.

Fig. 4 is a representation of another small pendant with the invocation, *Ya Allah!* "O God!" embossed upon it, and it will readily be perceived how easily composite necklaces of this kind may be varied.



Fig. 1.



Fig. 3.



Fig. 4.



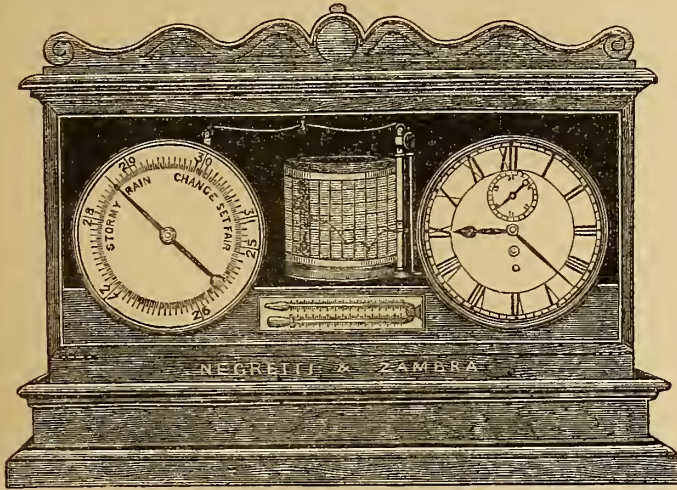
Fig. 2.

"NEGRETTI AND ZAMBRA'S ENCYCLOPÆDIC, ILLUSTRATED, AND DESCRIPTIVE CATALOGUE. 500 pages, large 8vo. Negretti, Holborn Viaduct."

THE title of this work indicates the comprehensive and practical utility which it so fully sustains. Unlike the majority of similar volumes, the one before us renders its readers deeply indebted for the valuable and instructive information therein contained, and becomes of considerable educational value, not only on account of the detailed descriptions and engravings of various scientific instruments, but likewise for the numerous essays of an explanatory and historical character which are found in its pages.

Every important instrument is not alone fully explained, but its entire arrangement plainly exhibited by carefully-drawn engravings, and numerous tables are added in order to render the book a standard work of reference.

As an instance of one of the very many detailed descriptions contained therein, we have selected the following account of that valuable and important instrument known as the SELF-RECORDING ANEROID BAROMETER, shown in the accompanying illustration.



"This instrument is arranged to show the various fluctuations that have taken place in the barometer during the observer's absence. It consists of a large and carefully finished Aneroid, and an eight-day Clock; between these is placed, in a vertical position, a revolving cylinder having a metallic meter scale. Close to this paper is a pencil mounted on a metallic rod, and moved up and down as the variation of atmospheric pressure acts upon the vacuum chamber of the Aneroid; at every hour this pencil is made to mark the paper by simple mechanism in connection with the Clock.

"By this means a black-dotted, curved line is produced on the paper, showing, at a glance, the present height of the barometer—whether it is falling or rising—how long it has been doing so, and at what rate the change has taken place; all of which are particulars most essential to know, and which can only be obtained from an ordinary barometer by very frequent and regular observations."

We might give numerous other quotations of an equally interesting character, but would scarcely know where to commence or stop, since each page of the book reveals some new and important matter.

An index of nearly forty pages assists the reader in the search after general information, and will be found a guide of no ordinary value.

The work should not only be in the hands of every one interested in the trade, but also in possession of the educated public.

"I NEVER complained of my condition," says the Persian poet Sadi, "but once, when my feet were bare, and I had no money to buy shoes; but I met a man without feet, and became contented with my lot."

THE wind is unseen, but it cools the brow of the fevered one, sweetens the summer atmosphere, and ripples the surface of the lake into silver spangles of beauty. So goodness of heart, though invisible to the material eye, makes its presence felt; and from its effects upon surrounding things we are assured of its existence. —*Anglo-Indian Advertiser.*

FARMERS gather what they sow, while seamstresses sew what they gather.

THE SULTAN'S GEMS.

FROM a recent letter from Constantinople to the *Providence Journal*, we quote: "The accounts which are given of the riches hoarded in the palace have the savour of the tales of the 'Arabian Nights.' Beyond doubt, a vast deal of wealth, in the form of diamonds and precious stones, is accumulated there. The ostentatious display by the Shah of Persia of his wealth in this direction, on the recent tour of visitation with which he favoured Europe, is well-known. Among a profusion of jewels on his person, he was accustomed to wear a cap heavily embroidered with diamonds, and fastened at the front with a brilliant of enormous size. On the occasion when the Sultan was to receive him as his guest, the grand staircase and the corridor leading to the audience room were, in anticipation of the arrival of the Shah, ordered to be laid with heavy Smyrna rugs studded all over with diamonds, emeralds, and sapphires, so that the royal visitor was obliged to tread under his feet the evidences of greatness which he wore on his head. The Sultan received him, as he stepped upon the staircase, in a plain dress, wearing his usual simple fez of scarlet cloth, and without personal adornment of any kind. A neat bit of sarcasm for a barbarian. Any visitor at Constantinople can procure a firman from the Sublime Porte to visit the imperial treasure-house at the old Seraglio, where he will see more wealth in jewel-studded trinkets, diamond-mounted sword-hilts, belts, scabbards, horse furniture and caparisons, cups, vases, articles of Eastern workmanship, and single stones of immense value, than would buy the crown jewels in the Tower of London twice over. A specimen of the contents of this repository, in the form of a golden throne set with precious stones, and which were formerly a present from Persia, is to be sent to the Centennial Exhibition. It was one of the contributions of Turkey to the Vienna Exposition. Just now it is the fashion for the women of the harem to make costly presents to the Sultan. These presents are usually something in the direction of the national armament. The mother of the Sultan, who seems to have a head for business, has the credit of inventing this substantial form of feminine blandishment. Some fine pieces of artillery have been thus contributed to wake up the royal favour."

NOVELTY IN SHOW CASES FOR THE PHILADELPHIA EXHIBITION.

MR. C. JEFFREYS, of Hatton Garden and Robin Hood Lane, is completing a very elaborate and novel show case for the Philadelphia Exhibition, and which we have recently had an opportunity of inspecting. The case is six feet square and eleven feet in height, at the top of which is the flag of all nations. The ornamental part round the top of the case is supported by elaborately carved pillars and presents a remarkably handsome appearance. One very novel and peculiar feature of the case is that, although of such large dimensions, it may easily be taken to pieces and the entire article packed in a box 6 ft. by 3 ft. Instead of requiring considerable time and labour to separate and replace, the different parts are so hinged together that the work of packing and unpacking, taking down and placing up, is a very easy matter. This is a new feature in the manufacture of large show cases, and will doubtless be generally adopted. The entire case will be one of the finest specimens of workmanship which has been produced, and will show the American trade what the skill and ingenuity of our English makers can accomplish, and we think that very few specimens of show cases will command more attention than the one here alluded to.

While passing through the factory, we had an opportunity of inspecting the many different departments, each of which contains a selection of handsome articles in the process of manufacture. Among them may be mentioned the shop front building department, occupying three floors, where the shop fronts and larger fittings are turned out; the brass finishing and brass fitting room, where all the brass work is executed; and here we saw several elaborate patterns of brass brackets for shop windows.

The lamp-making department, where lamps and reflectors for outside of shop windows are made, has many facilities for the manufacture of improved articles for such purpose. Passing into other rooms, where the manufacture of trays and stands form a leading and distinct branch of the establishment, we saw handsome specimens of trays, velvet stands, jewel cases, trays for exhibiting jewelry in windows, and numerous other articles used by the trade. We can hardly select one of which to speak specially, since the assortment thereof is so extensive, embracing every variety and description necessary to complete a well-fitted establishment, finished in all styles, and calculated to suit all tastes.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical goods, or kindred articles.

2827. ROBERT WHARTON PARKIN, of Sowerby Bridge, in the county of York, Safe and Lock Manufacturer, for an invention of "Improvements in locks for safes, strong rooms, and other purposes."—Dated 11th August, 1875.
2868. JOHANN FISSLTHALER, of 24, Northampton-square, Clerkenwell, in the County of Middlesex, Watch Maker, for an invention of "Improvements in perpetual calendars or almanacks."—Dated 14th August, 1875.
2869. JAMES MUIRHEAD, of Glasgow, in the county of Lanark, North Britain, for an invention of "New or improved studs for fastening sleeves, shirt-fronts, and which may be used for other similar purposes."—Dated 14th August, 1875.
2917. ALFRED JOHN HIGHAM, of 13, Blackheath-terrace, Blackheath, in the county of Kent, Gentleman, for an invention of "Improvements in clocks and other timekeepers."—Dated 18th August, 1875.
2921. JOHN HENRY JOHNSON, of 47, Lincoln's-inn-fields, in the county of Middlesex, Gentleman, for an invention of "Improvements in electric clocks or clock-work."
2969. FRANCISCUS XAVER FERDINANDUS HEILBORN, of Birmingham, in the county of Warwick, Jeweller, for an invention of "Improvements in fastenings for articles of dress and ornaments, and in locket and ornament suspenders."—Dated 24th August, 1875.
2970. ELIJAH ATKINS, of Birmingham, in the county of Warwick, Manufacturer, for an invention of "Improvements in solitaires, sleeve links, and other like articles."—Dated 24th August, 1875.
2985. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton-buildings, London, for an invention of "Improvements in watches and similar timekeepers."

Notices to Proceed.

1517. GEORGE WILLIAM DAWSON, of Birmingham, in the county of Warwick, Manufacturing Jeweller, has given notice in respect of the invention of "Improvements in or additions to seals for chains, bars for chains, lockets, and charms, which improvements or additions may also be applied to watch keys."—As set forth in his petition, recorded in the said office, on the 24th day of April, 1875.

Patents Sealed.

764. JOHN CHESHIRE, of Birmingham, in the county of Warwick, Cork-screw Manufacturer, for an invention of "Improvements in solitaires, sleeve links, and other like dress fastenings and ornaments."—Dated 2nd March, 1875.

Letters Patent for Inventions which have become Void by reason of the Non-payment of the additional Stamp Duty of £100, before the Expiration of the Seventh Year from the date of such Patents, pursuant to the Act of the 16 Vict., c. 5, sec. 2.

2469. CHARLES JOHN CURTIS and AUGUSTINE FIDDES, both of the city and county of Bristol, for an invention of "Improvements in safes and strong rooms."—Dated 7th August, 1868.
2869. JAMES MUIRHEAD, of Glasgow, in the county of Lanark, North Britain, for the invention of "New or improved studs for fastening sleeves, shirt-fronts, and which may be used for other similar purposes."

Patents Granted in Foreign States.

FRANCE.

- 106,212. DUMOULIN-FROMENT, of Paris, for "Mechanical contrivances for regulating electric apparatus, such as telegraphs, clocks, registering apparatus, and especially Morse dial-telegraphs."—Dated 31st December, 1874.

AUSTRIA.

- 12 BOLZANI & FUSSEL, of Vienna, for "Obtaining gold, platina and silver articles combined with irised shells."—2 years.—(Secret.)—Dated 21st April, 1875.
49. C. L. LUSTIG, of Vienna, for "Obtaining 'so-called niello bronze.'"—3 years.—(Secret.)—Dated 30th April, 1875.

PRUSSIA.

10. H. MERLET, of Nantes, for "A suspension of pendulums for time-pieces."—3 years.—Dated 18th June, 1875.

BELGIUM.

- 37,445. W. SOUTHWOOD, for "Improvements in day and month indicators for clocks, &c."—Dated 12th July, 1875.
- 37,562. L. A. CASSET, for "A process for obtaining transparency in leaves of gold, platina, &c."—Dated 2nd August, 1875.

UNITED STATES.

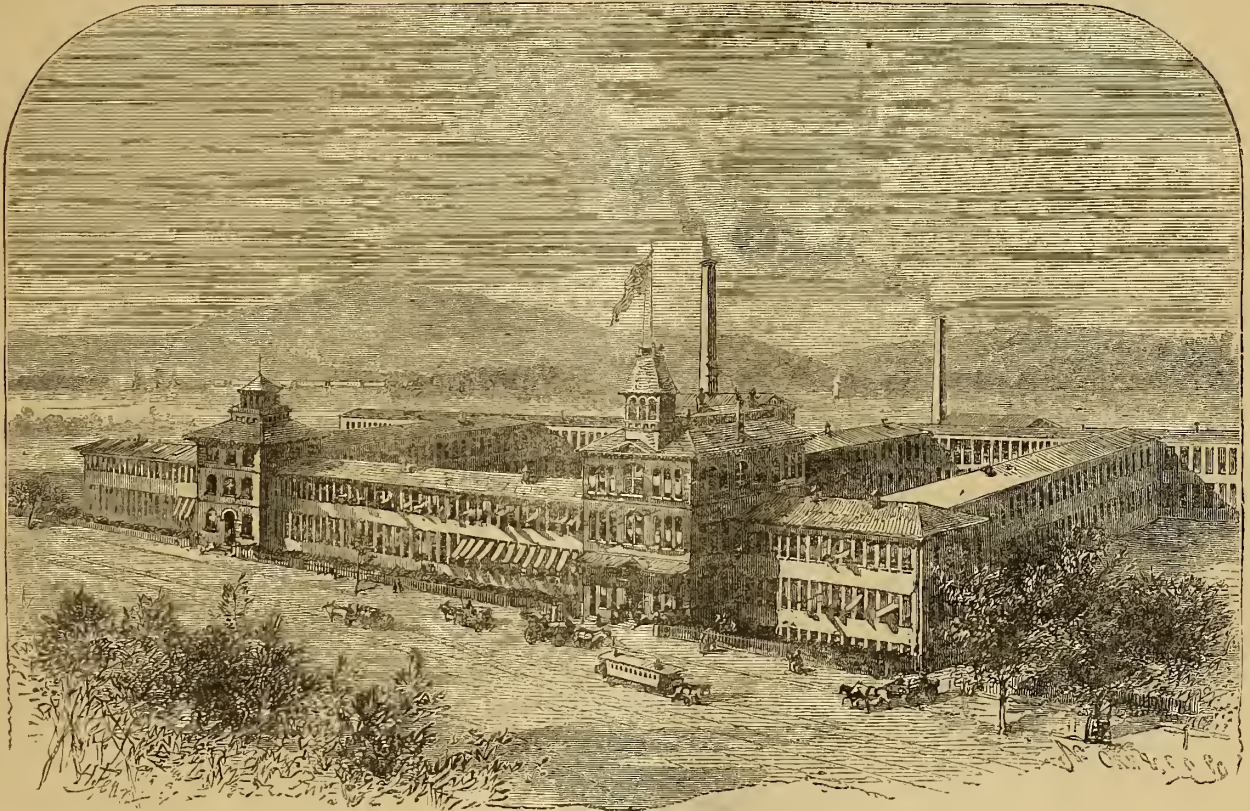
- 164,714. FRANK R. BUCKLIN, of East Tilton, N.H., for "Tools for pivoting watch-wheels."—Application filed 8th May, 1875. *Brief.*—A plunger or piston is provided in its outer end with a seat to receive the pivot and post of a wheel to be repaired, the wheel being held in place by a retaining-cap, through which the post to be repaired projects. Above the cap is a retaining socket, in line with the socket in the plunger, to contain and hold in place the pivot while being soldered.
- 164,819. JOHN C. DUEBER, of Cincinnati, Ohio, for "Watch-keys."—Application filed 28th April, 1875.
- 164,918. ISAAC N. HOPKINS, of Lockport, assignor of one-half of his right to G. H. Shattuck, Medina, N.Y., for "Watch-case springs and catches."—Application filed 17th April, 1875. *Brief.*—New spring may be inserted without removing the catch for cover, the catch being attached to the push-pin.
- 165,009. W. I. LUDLOW, of Rochester, N.Y., for "Pencil-cases."—Application filed 3rd December, 1874.
- 165,199. JOHN J. BAUSCH, of Rochester, N.Y., for "Eyeglasses."—Application filed 8th May, 1875. *Claim.*—An eyeglass provided with self-adjusting nose-pieces closed at both ends, as and for the purpose described.
- 165,251. WM. H. PECKHAM, of Big Springs, Kans., for "Eye-glasses."—Application filed 9th June, 1875.
- 165,275. LYMAN W. THOMPSON, of Cherry Valley, N.Y., for "Safety-pinions for watches."—Application filed 25th April, 1874. *Brief.*—A safety-wheel in which the recoil, when the mainspring breaks, acts upon a flat curved spring, causing a stud attached thereto to rise from the inclined notch in the third wheel, thus releasing said wheel from connection with the train.
- 165,317. R. B. ESLER, of Philadelphia, Pa., for "Charms for Watch-chains."—Application filed 15th April, 1875.
- 165,432. W. A. TERRY, Bristol, Conn., for Calendar Clocks. *Brief.*—A perpetual Calendar, in which the varying changes of the months and years are regulated by the contact of a compound lever, with certain stop devices.
- 165,548. A. A. COWLES, New York, N.Y., for Calendar Clocks. *Brief.*—The cylinder, carrying the calendar for the month, is moved through the medium of a lever actuated by certain devices connected with the striking mechanism.
- 165,635. OLIVER D. WARFIELD, Chicopee, Mass. *Brief.*—Elastic bars form a case or cover for a watch key, knife blade and several other tools.
- 165,722. THOMAS W. FRY, of Providence, R.I., for "Setting gems."—Application filed 23rd June, 1875. *Brief.*—"The receiving-cup protects the gem from dust, &c." *Claim.*—"In a setting for stones of jewellery, the combination of a crown or other open setting with a stone-receiving cup, substantially as and for the purpose described."
- 165,723. JOSEPH U. GEROW, of Brooklyn, N. Y., for "Pen and pencil cases."—Application filed 2nd February, 1875. *Brief.*—"The pencil is extended by the reverse movement of the pencil-slide, which at the same time projects the extension-tube. Projecting the pen retracts the pencil if it be extended. Either pen or pencil may be projected separately, and the pencil is retracted by pressing in the extension-tube."
- 165,774. PHILLIP H. WHEELER, of Rockford, Ill., for "Watch-makers' boxes."—Application filed 31st October, 1874.
- 165,811. JOHN FEIX, of San Francisco, Cal., for "Crucibles."—Application filed 7th July, 1875. *Brief.*—"A crucible of ordinary construction is provided with a ring or annulus of the same material, to fit upon the mouth or top of the same forming a continuation of said crucible, to hold the loose metal or bullion packed therein, thereby preventing the ingress of coals, or the loss of metal by slushing." *Claim.*—"In combination with an ordinary crucible, a ring or annulus adapted to fit upon the mouth or top thereof and form a continuation of the same, substantially as and for the purpose herein described."
- 165,840. LUKE S. KELLOGG, of Leon, N. Y., for "Clock-calendars."—Application filed 22nd May, 1875. *Brief.*—"The lift-bar is carried up by the revolution of the hour-hand shaft, and actuated by its connecting devices, the ratchet-wheel carrying the calendar. The incline below the notches permits the bar to drop to its first position."
- 165,904. MYRON W. WIARD, of Waukegan, Ill., assignor to himself and Charles F. Wiard, of the same place, for "Eyeglasses for watch-makers."—Application filed 30th June, 1875.

Designs Patented in Foreign States.

UNITED STATES.

- 8406 to 8408, inclusive, dated 22nd June, 1875. LEONARD S. BEALS, of Astoria, N. Y., for a "Breast-pin."—Application filed 2nd June, 1875. Term of patents $3\frac{1}{2}$ years. Cases A', B', and C'.
- 8409, dated 22nd June, 1875. LEONARD S. BEALS, of Astoria, N.Y., for a "Scarf-ring."—Application filed 2nd June, 1875. Term of patent $3\frac{1}{2}$ years.
- 8421, dated 22nd June, 1875. CHARLES KITSCHULT, of New York, assignor to Nicholas Muller's Sons, of the same place, for "Thermometers."—Application filed 14th May, 1875. Term of patent 7 years.

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HOROLOGY.

(Continued.)

V.—CLEPSYDRÆ.

WE give in the present number an illustration and description of the celebrated clepsydra of Ctesibius, and if our readers will study it a little, they will have no difficulty in sufficiently comprehending the action of it. We may well wonder, with the perfect machinery of our day in its various automatic ramifications, at the contrivances of the ancient engineering world. Although man's inventive genius has, especially since the introduction of steam, bounded forward at a marvellous pace, yet his nature seems to be much the same. The great aims of the engineers of those times were the perfection and invention of machines for the destruction of their kind: the sling, the dart, the catapult, and the ballista, as the artillery of war. It is a curious feature of human character that the successful commander is always placed on a pedestal immensely higher than the successful inventor or discoverer. Such is our nature, and has been from the earliest ages, that the "mighty men of valour" have been more greatly exalted than the mighty men of science. Astronomy, electricity, chemistry, and mechanism must stand aside until the acclaimed conqueror and his cavalcade pass. Indeed, the pursuit of arms has been held from the dawn of history to be the noblest profession of man. In proof of it we find that, at the very time of the invention of the clepsydra, Ctesibius was thinking more about the art of war—for he wrote a book on it—than he was thinking about time-keeping. Hero, too,

who missed, by little more than a ray of inventive light, the discovery of the practical application of steam, wrote on the appliances in war and the manufacture of darts. Nearly three thousand years ago we find the minds of the great not in connection with sundials, or water-clocks, but with war, as is shown by the following, from 2 Chronicles xxvi. 14, 15:—

Verse 14. "And Uziah prepared for them throughout all the host shields, and spears, and helmets, and habergeons, and bows, and slings to cast stones."

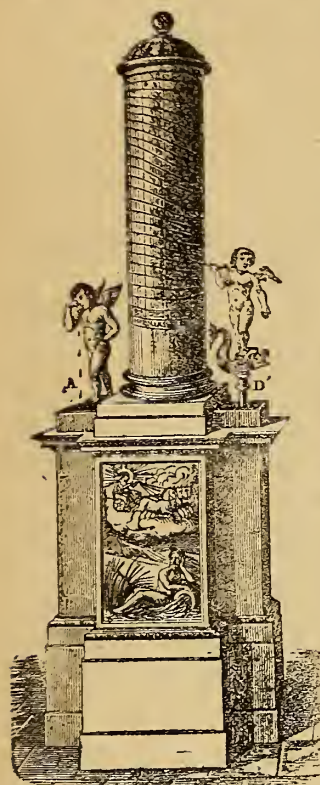
Verse 15. "And he made in Jerusalem engines, invented by cunning men, to be on the towers and bulwarks, to shoot withal. And his name spread far abroad; for he was marvellously helped, till he was strong."

Coming down the stream of history, past a ballista and catapult, we come upon other progeny of the same family. Cæsar, Cicero, Livy, Seneca, Tacitus, and other ancient writers, refer both to the catapult and the terrible battering-ram. Titus employed large numbers at the siege of Jerusalem, and there were above two thousand surrendered at the fall of Carthage. Vegetius, a writer of the fourth century, speaks of artillery under the names of ballistæ, onagri, scorpiones, arcabalistæ, fustibuli, and fundæ, but not one word about any time-keeping instrument. And the same feeling passes on through the age of gunpowder. The 81-ton gun tried the other day at Woolwich is far more talked about than would be the finest instrument that chronometric ingenuity could invent to measure the courses of the stars and direct the noble ship over the pathless ocean. However "noble" the profession of arms is in defending the weak against the strong, and punishing the wanton aggressor, we are afraid that, appealing as it does to the destructive faculties of mankind, it has had, and has, not only too

prominent a place in the estimation of nations, but, until we are educated for much higher purposes, it is likely to continue to have. It is related that Ctesibius was the son of a barber, the last trade—razor and shears notwithstanding—that would give to the world an inventor and writer upon appliances in war. One would have thought that “lathering,” according to his notions, would have taken a different direction altogether. However, he was not *all* war, and to show what he did in another direction, we will now draw the reader's attention to that.

The engraving represents the exterior of this great monument of the mechanical ingenuity of antiquity. The world is indebted to Claude Perrault, the illustrious architect of Paris, for the reproduction of the machine from the text of Vitruvius; whilst the more illustrious astronomer has given it a place in his no less famous book.

On the right is seen a winged child in tears. These tears, falling drop by drop from the siphon of a cistern which has a constant level, feed the clepsydra. On the opposite side is another winged child standing on the head of a dolphin, having an arrow in his right hand pointing on the hours of a column. Near the bottom of this column are two circles, the one indicating the signs of the zodiac and the other the names of the months. On the pedestal is an entablature of the chariot of the sun, and underneath, another of a river god. Here is one of the beauties of the arrangement. The tears that fall from one child causes the other with the arrow to rise and mark each successive hour. The reader will observe two sets of hours, one for day and the other for night. The interval between the rising and the setting of the sun was divided into twelve parts equal in each day, but different from one day to the other, so that a different dial was required for each day in the year. The



THE CLEPSYDRA OF CTESIBIUS, RESTORED BY PERRAULT.

From Arrago's "Popular Astronomy."

column, therefore, turned on its axis, and, to produce that turning, we must refer to the concealed mechanism in the pedestal; we shall, also, there find the causes of the other effects. Through the leg of the weeping child is a tube that supplies the tears from the reservoir. These tears fall into a small basin at the child's feet, and pass away through a hole and down a pipe that crosses at the bottom and empties into a perpendicular water-tight compartment which occupies that part of the pedestal to the right of the river god, and immediately under the dolphin statuette. In this compartment is a rod fixed into a square cork float at the lower end, having the dolphin and child at the upper end. Now, on the principle of water finding its level if left to flow without interruption, it follows that when the tears accumulate and fill the crossing pipe opening under the float, that float must rise, and with it the recording angel on the dolphin's head. But, once up, the reader will say, how does it get down again? Well, that, too, is very simple, and the very means of letting it down are utilized for other work.

At the end of the twenty-four hours the float has reached the top. At the bottom of the float chamber is the end of the shorter limb of a siphon, having its bend at the top where the float is stopped; the lower end opens into the float, whilst the other and longer limb crosses the pedestal and terminates beneath a platform. The action is this:—As the water in the floating chamber rises, it also rises up the short limb of the siphon beside it. When it reaches and fills the siphon's bend, that instrument is put in action and the chamber water begins to flow through it, and continues until the chamber is completely empty, and the float, dolphin, and child are at the bottom again, ready to begin the marking of the next day's hours! But the siphon water does not run to waste yet. Under the platform of the pedestal is a small water-wheel, into the troughs or buckets of which this siphon water flows; these troughs are so arranged that the wheel revolves by the weight of the water

only once in six days. At one end of the axis of the wheel is a six-leaved pinion that takes into a crown-wheel. The crown-wheel having sixty teeth, as against the water-wheel's pinion of six leaves, consequently it only makes a complete turn in sixty days. On the arbor of the crown-wheel is a pinion, taking into another wheel in the centre of the pedestal, of six times the pinion's dimensions; consequently, the wheel only turns once round in three hundred and sixty days. Now, mark what this is for. This last-named wheel is keyed on a shaft at its lower end, where the pinion takes into it, and at its upper end into the hour column, which revolves in three hundred and sixty days. The last duty that the water did was that of turning the bucket-wheel. The reader will thus see that arbors, pinions, and crown and centre wheels are much older as portions of time-keeping machinery than a great many people are probably aware of. Yet there they were in action fully two thousand years ago! We cannot but admire the inventive contrivance of the man who visibly made the falling tears of a statnette-child mark the days and months of the year. Such was the clepsydra of Ctesibius. We may very fitly conclude our observations on the clepsydra by stating that, although, since the middle of the last century, it has been a mere scientific toy, there are, we believe, one or two exceptions to that. On referring to the latest report of the astronomer-royal from Greenwich, we find that a water-clock is in daily use there. Whatever its construction is, we may depend upon it that, in the words of the learned head of that scientific establishment, "its performance has been most satisfactory."

(To be continued.)

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 52.)

NICHOLAS FACCIO, of Duiller, a mathematician, who was born at Geneva, or Basle, on February 16th, 1664, is said to have first invented the application of jewels in watchwork, to diminish the friction of the pivots, at the beginning of the last century. The experiment was, however, tried much earlier. To Faccio belongs the merit of having been the first to discover and apply the art of piercing rubies, to receive the pivots of the balance-wheel, prior to, or about, the year 1700. In the *London Gazette* of May 11th, 1704, we read: "Her Majesty having granted to Mr. Nicholas Faccio, gentleman, of the Royal Society, Peter Debaufres and Jacob Debaufres, watchmakers, her letters patent, &c., for the sole use in England, &c., for fourteen years, of a new art invented by them, of figuring and working precious or common stones, crystal or glass, and certain other matters, different from metals, so that they may be employed in watches, clocks, and many other engines, as internal and useful parts of the engine itself, in such manners as were never yet in use. All those that may have occasion for any stones thus wrought, may be further informed at Mr. Debaufres' in Church-street, near St. Anne's. There they may see some jewel watches, and some essays of free watches, and wholly free watches, and all belong to the same art." The inventors, Faccio and the two Debaufres, were not satisfied with their fourteen years' patent, and, therefore, they applied to Parliament for an extension of the term, and also for an Act for the sole monopoly of the art of clock and watch jewellery. This application was opposed by the Clockmakers' Company (*malgre* their own chartered monopolies in past times), and the matter was referred to a Committee of the House of Commons, who decided against the applicants. In the journal of the company are the following entries relating to this affair:—

1704, December 11th.—"A Special Court was called upon the occasion of Nicholas Faccio, Peter de Baufre, and Jacob de Baufre, having petitioned the House of Commons, for an Act for the sole applying precious and more common stones in clocks and watches, and for the enlarging the term of their patent. Their reasons for such an Act were read, as also reasons of several members of the Court by way of answer, and it was ordered that the Master, Wardens, and Assistants should petition Parliament and oppose the Bill."

1705, January 5th.—"The Master reported there has been a constant diligence used in obstructing the Bill in Parliament, brought in on the petition of Nicholas Faccio, Peter de Baufre, and Jacob de Baufre, for the sole supply of precious and more common stones in clocks and watches, viz.: That Parliament had been petitioned against the Bill, and that the petitioners had been heard by Counsel before the Committee on the Bill, who had made such amendments to it that they thought it best to destroy it, and had therefore struck out all parts thereof save the words 'Be it Enacted,'"

and reported accordingly. The Master also acquainted the Court, that in the proofs brought against the Bill there was an old watch produced, made by Ignatius Huggefard, that had a stone fixed in the cock and balance work, that was of great use to satisfy the Committee; and it was ordered that the Renter Warden do buy the said Watch, if he can, to be kept for the Members of the Court. The same was bought accordingly of Henry Masson, for 2l. 10s., he having bought it of Henry Scale, and it was placed in the Master's hands."

There seems to be a touch of sarcastic humour about the passage we have italicised above. The watch purchased by the company was exhibited by them to the Society of Antiquaries of London, on June 8th, 1848. It was made before the use of the pendulum-spring, and had a large amethyst mounted in the cock. Huggefard was a London maker. A pamphlet, published in 1704, purports to convey the "Reasons of the English Clock and Watchmakers against the Bill, to confirm the pretended new Invention of using precious and common Stones about Watches, Clocks, and other engines;" and another contains "Reasons humbly offered by the Jewellers, Diamond Cutters, Lapidaries, Engravers in Stone, &c., against the Bill for Jewel Watches."

By the Camden Society's "Original Letters," vol. xxiii., we find that Dr. William Derham wrote to Richard Towneley, on March 28th, 1705, as follows:—"The new contrivance of applying precious stones to watches, I had the good fortune to see, when Mr. Facio, the inventor, and an ingenious man, and Mr. Debauffre, the workman, presented their watches, to have the approbation of the Royal Society. I found they had a better opinion of their invention than I could have; for I never thought it to deserve an Act of Parliament One of these contrivances I remember I saw some years before in a large wooden house watch, contrived and made by one Mr. Westell, an ingenious gentleman in London."

Faccio seems to have been a good scholar, and an ingenious man. Bishop Burnet, in the first letter of his *Travels*, dated September, 1685, speaks of him as an incomparable mathematician and philosopher. In 1687 he came to England, and made the acquaintance of Sir Isaac Newton. He was a teacher of mathematics in Spitalfields, and being early one of the French prophets, he applied his pen with some acuteness, and much appearance of piety, in their behalf, becoming their chief secretary, and committing their warnings to writing. In 1707 Dr. Ames, one of their brotherhood, having lately died, these impostors gave notice that he would rise again within a fortnight. Guards, however, were placed at his grave to prevent any tricks being played. At last Nicholas Faccio, John Defude, and Elias Marion were prosecuted at the charge of the French churches in London, and sentenced by the Court of Queen's Bench to stand twice on the scaffold at Charing Cross and the Royal Exchange, with a paper denoting their offence, as disturbers of the public peace and false prophets. Faccio was too lavish in the prosecution of inventions and projects, which never repaid him. He died at Worcester in 1753. Many of his original letters and papers are in the British Museum; and among them is one of his Latin poems, entitled 'N. Facii Duellerii Auriacus Throno-Servatus,' in which he claims to himself the merit of having saved William III. from falling into the hands of the French by a stratagem of Count Fenil, a Piedmoutesc, which Faccio fortunately rendered abortive in 1686. In the beginning of that poem, which contains a curious narrative of the whole affair, he lengthily and not inelegantly describes the jewel-watches of which he claimed to be the first inventor.

In the South Kensington Museum is a gold watch in a chased and embossed outer case; the gold dial is also chased. The maker's name is Debauffre, of London. The diameter is $1\frac{3}{4}$ inches. This watch was purchased at the Bernal sale for 11l. 10s. Mr. A. J. B. Beresford Hope has a square green enamelled watch, with a painted dial, the maker being Debauffer, of London. Probably both of these watches were made by Faccio's co-patentees; although the orthography of the names differ.

Besides the above, Mr. Hope has also a gold repeater-watch, with a chased outer case, the subject being Jupiter and Juuo. It is of the eighteenth century, and the maker was Herrmann, of Neuberg. Also a silver repeater-watch, with white enamel dial, the maker being Boursalt, of the same period. Also a gold watch, with complicated movements and dials on the back and front, the date being the same as the above.

(To be continued.)

WHY is a thief your only true philosopher?—Because he regards everything from an abstract point of view, is opposed to all notions of protection, and is open to conviction.

A TREATISE ON PITCHINGS.

(Continued from page 59.)

IT is an essential property of the cycloid, and of all epicycloids, that the line drawn from the point of contact to the describing point be always perpendicular to the cycloid.

CED (Fig. 3) is a portion of a cycloid described by the circle AED; the describing point is E; the point of contact, which changes continually, will be at A when the describing point E describes the small portion Ee of the cycloid, or we may imagine that at that very instant the circle AED turns very slightly on the point A, in such a way that the line AE describes a small arc, Ee, of a circle HEG, of which the centre is at A. This circle will be mixed * up with the cycloid at Ee, since both are described by the point E, therefore the line or radius AE, which is perpendicular to its own circle, will also be perpendicular to the cycloid at E. The like may be shown with regard to all the points of the cycloid, and in all the epicycloids similar to Fig. 2.

XIV. Next to these preliminary ideas, we are about to pass on to the general principles of the demonstrations, which must be well understood before proceeding farther. Let the circle MK represent a wheel without teeth (Fig. 4), and the small circle MN a pinion without leaves; let the wheel drive the pinion by the simple con-

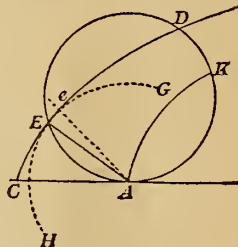


FIG. 3.

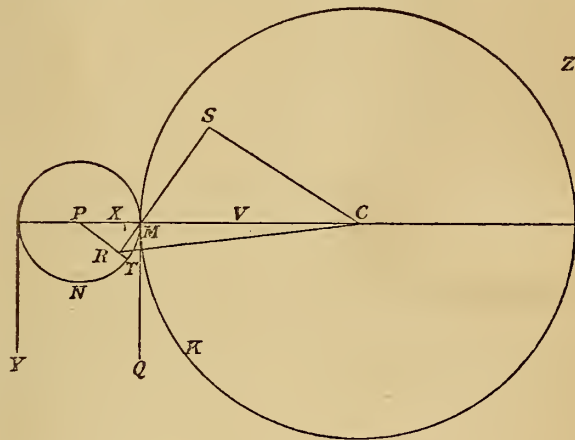


FIG. 4.

tact of its circumference, from M to N, in such a manner that the pinion be compelled to turn with the wheel, each around its own centre, as was seen in Art. XII., the circle A and the circle C M D of Fig. 2. It is clear that then the circumference of the pinion will have precisely the same velocity as the wheel, since each point of the wheel will cause a point of the pinion to pass on; this will therefore be the greatest velocity that the wheel can impart to the pinion, for it will not be capable of giving a velocity greater than it actually possesses. It is again certain that the wheel will drive the pinion with the greatest velocity of which it is capable, for it will act through a lever, CM, equal to its radius, in such a way that the motive force impressed at Z, to turn the pinion by means of a wheel, could not act on the point M by a shorter lever, otherwise it would act in the direction M Q, perpendicular to the lever or radius, P M, of the pinion, and there is not any other direction more favourable than that which acts perpendicularly.

In the supposition we have just made of the movement of the wheel and its pinion there is no friction, because the wheel and pinion only touch each other in one point, and that the same point of the wheel does not run along different points of the pinion, which would be necessary to produce friction; or, if there be any, it is the smallest possible, because the least amount of friction is that of a rubbing surface of which the direction is parallel to that against which it rubs, or the direction of the movement of the wheel which takes place in the line of the tangent M Q is the same as the direction of the pinion; the rubbing force is also the smallest possible, since a wheel which ought always to act by its

* Confonder, joined together.

circumference, can only act by its radius, and always perpendicularly to the line of centres.

XV. We shall then have satisfied all the conditions of a perfect pitching, if we can give teeth to the wheel M K and leaves to the pinion M N, such that when the teeth of the wheel act on the leaves of the pinion the force, velocity, and direction of the wheel and pinion at M remain the same as they were in the case which we have just supposed, where the action took place at the point of contact M.

XVI. To accomplish this object, I, in the first place, consider one of the radii P T as a leaf of the pinion; through the point of contact M of the two circumferences, I let fall upon it a perpendicular R M S; from the centre C of the wheel I draw C R, and a line C S perpendicular to the line R M S. I am about to prove that the action of the radius C R, to drive the point R of the pinion, will be the same as the action of the point M in the case of Art. XIV., in order to drive the radius P M.

XVII. If the motive power Z, instead of acting through an arm of the lever C M, on the point M, acted by means of a lever C V, which should be the half of C M, it would be a double advantage; but if this double gain were applied to the point X of the pinion in such a way that P X should be the half of P M, as there would be at the point X a half less amount of force to raise the weight Y, things would remain in the same condition, and the motive force would act with the same force as before on the weight Y.

It would be the same in regard to the velocity. The motive force Z would only give at the point V the half of its velocity, but that amount of velocity applied to the point X would produce a double velocity at the point M; thus the velocity would be again the same as in the case given at Art. XIV.

The same effect would be produced if a quarter, or any portion whatsoever of the radius M C, of the wheel be cut off, provided that the quarter, or any similar portion, of the radius P M be taken away, because as long as there exists the same relation between the lever C V or C M, through which the motive force acts, and the lever P X or P M, by means of which the weight Y or the pinion offers resistance, the force and velocity will be always the same, as in Art. XIV.

XVIII. In the case where the wheel acts upon the point R of the radius P R, the line R M S being drawn perpendicular to P R and C S; C S is the lever through which the wheel acts, and P R is the lever through which the pinion resists; for whether the force which pushes the pinion be placed at R, or M, or S, it will always produce the same effect; there is only the distance C S to the centre of the wheel which determines its effort upon the pinion. Every time that the line of direction R M S passes through the point of contact M, of the primitive pinion and primitive wheel, the line C S and the line P R will be in the same relation to each other as C M and P M, for the triangles C M S, P M R are alike, since the angle S M C is equal to the angle P M R, being vertical opposite angles, and the angles at S and R are right angles; thus, the two triangles being equal in all respects, their homologous sides will be proportionals, and C M will be to P M as M S is to M R; there will then be between the lever of action C S and the lever of resistance P R the same relation as between C M and P M; therefore there will be a force and a velocity equal to those we had in Art. XIV., when the wheel drew the pinion along by its circumference at M.

XIX. Here, then, is a general proposition which will serve as the groundwork for all we are about to advance. Every time that the line M R, drawn from the point of contact of the two circumferences perpendicular to the leaf of the pinion, shall pass on to the point R, whither the leaf will be led, the pinion, being driven through this point there, will receive from the wheel the same force and the same velocity as if it had been drawn along by the point M; that is to say, its force and velocity will be the greatest possible. Thus, every time that the leaf of a pinion be driven by the tooth of a wheel, it is required that the line drawn from the point of contact of the two circumferences to the driving point, or the touching of the leaf and the tooth, fall perpendicular to the leaf and the tooth.

XX. To apply this principle to a pinion which shall be composed of staves infinitely drawn out into thin lines, represented by mere points, such as A, B, C, D (Fig. 5), it is necessary to recall to mind that the primitive wheel M C, drawing along the primitive pinion M D by its circumference, a point D taken in the circumference of this pinion will describe an epicycloid C D E, Art. XII., and that it is an essential property of this epicycloid that the line M D, drawn from the point of contact M to the describing point D, be always perpendicular to the curve, Art. XIII.; therefore, if we make a tooth having the form of the

curve C E, it will drive the point D, in accordance with the conditions laid down in the preceding article, that is to say, the line drawn from the point of contact M to the driving point will be always perpendicular to the leaf and the tooth.

XXI. It is perfectly immaterial that the tooth C E act only on the pin,* or on the staff D,† or that there be at the same time several teeth acting on several pins, for each one will sustain a part of the effort which would have been combined against one only, and the entire action of the wheel will be the same as before.

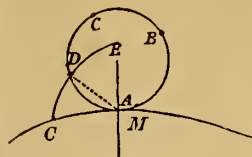


FIG. 5.

(To be continued.)

PRECIOUS STONES.

GENERAL OBSERVATIONS (continued from page 79).

FROM the most remote antiquity, and previous to every historical tradition, men anxiously sought for gems, and it pleased even the most rude and savage people to use them as ornaments and signs of civil, military, or religious dignity. Of this we are certain from the discoveries made in the most ancient tombs of Asiatic, Tyrrhenian, and Egyptian people, where gems were found, differing in quality, but almost all cut and wrought in the same manner. It appears that sapphires, emeralds, rubies, pearls, as well as jargoons, garnets, and agates, were the gems most anciently known and used. Before these, we find ornaments were used of amber, glass, and enamel, together with bronze, gold, and silver, whence we conclude that, although nature supplied man with very hard stones, which required no labour but that used in discovering and digging them out, he, nevertheless, applied himself first to the manufacture of glass, amber, bronze, silver, and gold, before using gems, perhaps on account of the difficulty of giving these a form suitable for armlets, necklaces, buckles, diadems, and rings. It is also remarkable that these ornaments of amber, as well as of glass, stone, silver, and gold, have been found from the first wrought in the same fashion, in the tombs of Tyrrhenia, Etruria, Egypt, Assyria, and Mexico. Whence in all parts of the world it has been found, according to the most recent discoveries and studies, that amber, bronze, glass, silver, gold, and enamel have been always used first; afterwards oxides and agates in their natural state, but soon after engraved; and lastly, gems, at first merely polished in their primitive forms, but finally engraved and in relief. The form of these ornaments and jewels was especially similar in that primitive period, as much in Egypt, Phoenicia, Assyria, as in Italy, Germany, and America. Amber was found in a great variety of forms, because more easily fashioned; glass was always in perforated globules, which, when threaded, formed necklets or bracelets; bronze, silver, and gold were found in forms differing according as the ductility of the metal allowed fine and finished work. Agates, like glass, were pierced as beads, or made into "margherite," flat, circular, oval, rhomboidal, or square. They were afterwards found engraved as cylinders and scarabæi, but also pierced; finally, gems were obtained in their natural crystalline form, but polished on the outer facets to give them transparency and brightness; after which they were, with much labour, pierced, and at last engraved. With regard to gems, as to many other things, the ancients had uncertain, if not altogether false, notions, almost always mixed with foolish superstitions. Pliny and Theophrastus asserted in their writings that, in order to preserve health, it was useful to wear certain gems. Every one knows how universal was the use of amulets, which were generally gems to which secret or supernatural virtue was attributed, as that of giving beauty, youth, honour, power, and fortune. The twelve stones which in the breastplate of the high priest of the Hebrews indicated the twelve tribes of Israel, are the same as those which, amongst the Romans, signified the twelve months of the year, and the signs of the Zodiac. They are:—

1. Jacinth	Dan	Aquarius	January.
2. Amethyst	Gad	Pisces	February.
3. Jasper	Benjamin	Aries	March.
4. Sapphire	Issachar	Taurus	April.
5. Agate	Naphtali	Gemini	May.
6. Emerald	Levi	Cancer	June.

* Cherite.

† Furcan.

7. Onyx	Zabulon	Leo	July.
8. Cornelian	Reuben	Virgo	August.
9. Chrysolite	Asher	Libra	September.
10. Beryl	Joseph	Scorpio	October.
11. Topaz	Simeon	Sagittarius	November.
12. Ruby	Judah	Capricornus	December.

An ancient Hebrew tradition states that when the high priest, on days of humiliation, asked the Most High to forgive the Israelites their sins, the precious stones of the breastplate cast an extraordinary lustre if the Lord graciously granted pardon, but became dull when His wrath was great towards His people.*

The Indians believe that a diamond taken with them in their long journeys is a certain earnest of safe return to the bosom of their families.† In the East the ruby is a stone of good augury, provided it is never shown to friends; it presages evil when it has a blackish spot.‡ The same stone is given by the Chinese in token of sincere friendship.§ Even in the present day the Persians believe that wearing the spinel causes joy and prevents evil dreams.|| Not a few people even in Europe think it very unlucky to receive the gift of an opal, or to possess a sapphire. One of the principal deities of the Peruvians—Esmeralda—had a niche formed of an enormous emerald.¶ Now, in speaking of the value of gems, we must mention a term known to all, and commonly used to distinguish broadly the most precious stones—the term Oriental gems. In fact, the gems discovered in the East generally excel in beauty those found in the West. But the qualities by which precious stones are distinguished from each other, and which in a greater degree prevail in the Oriental, are, as we have already stated—

- | | |
|----------------------|--------------------------|
| 1. Hardness. | 5. Chemical composition. |
| 2. Colour. | 6. Crystalline form. |
| 3. Clearness. | 7. Rarity. |
| 4. Specific gravity. | |

Therefore, according as these qualities, either all, or almost all, are united in good proportions in the same gem, the higher is its value and the more it is prized amongst precious stones and feminine ornaments. Whence, in giving a list of precious stones according to the value at present attributed to them, the above-mentioned qualities must be taken into account, and allowance made for the different value caused by diversity of size, greater or lesser transparency, and so on. Thus, considering them as equal in quality, they may be ranked as follows:—

- | | | |
|--------------|---------------|-------------------|
| 1. Diamond. | 7. Turquoise. | 13. Aquamarine. |
| 2. Ruby. | 8. Garnet. | 14. Peridote. |
| 3. Sapphire. | 9. Beryl. | 15. Chrysolite. |
| 4. Emerald. | 10. Jacinth. | 16. Tormaline. |
| 5. Pearl. | 11. Amethyst. | 17. Rock crystal. |
| 6. Opal. | 12. Jargoon. | 18. Agate. |

(To be continued.)

THE BRILLIANT.

IN Italy they generally denominate that diamond a "brilliant" which is cut on every side in many facets. With us the brilliant is a diamond rendered brilliant—that is, worked on the wheel to give it in certain proportions planes or facets, which, according to the law of optics, reflecting back luminous rays, cause the gem to shine with great brilliancy. It is not improbable that in a very remote period the Indians understood the method of polishing the diamond. A passage in Pliny (XXXVII. iii. 15), "the polished hexahedral diamond thins to a point," leads us to suppose that in his time it was known that the diamond itself was capable of wearing away other diamonds, and, therefore, of facetting and polishing them. They say, however, that antiquity of about 5000 years since claims a diamond which was polished on its natural planes, and belonged to King Carna, who, in India, was said to have lived 3000 years before the Christian era. It appears that, until the time of Charles the Great, the diamond in Europe was only planed on its natural facets and polished; four very large ones of this description can be seen even now in the buckle of that emperor's mantle. It appears probable that even in India they then began to cut the diamond, so as to add new facets to the natural ones.

About the year A.D. 1000 we find that in the jewels used by the great personages of Europe were sometimes diamonds having four rectangular planes and one upper facet, in the form of a parallelogram, leaving the under part in its natural state, but the stone on either side being equally polished; and this particular form preserves to this day the name of *Indian*, or, technically speaking, *lustre of India*. The wandering merchants who kept alive the Indo-

European commerce through the Caucasus, the Caspian, and the Steppes of Asia, were, perhaps, the first to bring into Europe the ideas which the Hindoos possessed on the art of diamond cutting. From the Bosphorus it reached the West; the Franks with Baldwin, the Venetians with Enrico Dandolo, the Hanseatics by the Valley of the Danube, derived it probably from Constantinople, and brought it to France, Italy, and Holland. Certain it is that from the beginning of the fourteenth century this art was practised with great industry in Paris and Venice; this is confirmed by the registry of the French Commune, and by the ancient Venetian shops. Thus, in the inventory of jewels belonging to Louigi D'Angio, made in 1365, various diamonds are mentioned, amongst which one having eight facets, and another in the form of a shield.

In 1407 we find that this art made remarkable progress in Paris, under the direction of a workman named Hermann, which name sounds more German than French. About that time the Duke of Burgundy, at a banquet which he gave in the Louvre to the King of France, presented to the noble guests, amongst other gifts, eleven diamonds, valued at 786 golden crowns. We are assured that in 1465 Bruges rivalled Paris in this respect, and amongst the legalized experts of that city there are registered in that year three diamond-cutters, or *diamants-liper*. Finally, the same year, Louigi di Berqueen, native of Bruges, and renowned as a mathematician and goldsmith, having perceived that the art of diamond-cutting was still in its infancy, and deriving rules for it from mathematical and optical principles, he arranged the inclination of the facets so as to produce the wonderful effects of light which are so much admired in the brilliant, and to which it has scarcely been possible to add anything from his time to our days.

A book entitled "The Wonders of the East Indies," attributes to Berqueen not only the perfecting but the invention of diamond cutting. This we have already proved untrue; let it be sufficient for the Bruges goldsmith to claim the merit of having (if we may so express it) given the diamond its true light. Roberto di Berqueen, his nephew, relates that Charles the Bold gave him five thousand ducats as a reward for cutting three very large diamonds, of which hereafter we shall relate the history. The disciples of this celebrated engraver went to Paris and Antwerp, but for want of rough material their art languished. And thus it went on until Cardinal Mazarin gave it new impetus, and protected it, so that in Paris diamonds were cut for all the courts of Europe. He entrusted to his engravers the twelve largest diamonds of the crown of France, that they might be newly cut, and thus have their lustre increased, therefore these were called the twelve Mazarins. About this time some Italian artists, who were very clever engravers, tried to cut the diamond. The hardness of this stone was conquered by art and perseverance. Giacomo da Trezezo, a Milanese, was the first to win praise in this difficult work. Clement Birago, also a Milanese, cut on the diamond the likeness and coat of arms of Prince Charles, son of Philip II., and this is asserted by Clusio Lomazzo, and Guilianelli. It is said that the celebrated Caradosso delighted in similar work. A lion's head, a Leda, and a head of Antinous, were, according to Caire, engraved in diamond by Giovanni and Carlo Costanzi, who were Romans. Whilst Venice, London, and Amsterdam, with treaties of commerce provided for the necessity of procuring sets of rough diamonds, France, after Colbert, did not foresee that the diamond mines of India would be nearly exhausted, and meanwhile fettered the art of diamond cutting by making regulations even to the number of tools to be retained by each artist; thus the industry of which we speak continually declined, and although under the great minister of Louis XIV. there had been seventy-five engravers, the greater part of them were dispersed at the revocation of the Edict of Nantes. Some withdrew to Holland, others to England, and the few who remained lost their work for want of the rough material. Under Louis XVI., near the close of the ministry of Calonne, a stranger, named Schrabasacq, wished, with the help of the state, to revive this art in Paris; he therefore opened a workshop, with twenty-seven mills for cutting diamonds, but in a short time he disappeared from Paris, and went no one knew whither. One of the engravers of the ancient Venetian school, Vincenzo Peruzzi, near the close of the seventeenth century, when trying to deprive inferior diamonds of colour, and to cut them so that they might acquire the brightest lustre, discovered the double facetting which renders the play of light so wonderful in the brilliant, and which is now adopted in gems of the best quality. At Venice those who exercised that art continued longer than was the case in France. Some remained there even in 1825, but the last of these died blind and poor in the hospital. At present diamond cutting is principally practised in Holland; after that country in England, and after England in France, where it promises to revive.

(To be continued.)

* Emmanuel, p. 28. † Feuchtwanger, p. 149. ‡ Ibid. § Ibid. || Ibid. ¶ Ibid.

FINGER RINGS.

(Continued from page 76.)

FROM "RAMBLES OF AN ARCHÆOLOGIST."

IN continuing the history of finger rings we shall briefly show the large amount of anecdote and curious collateral information it abounds in. Our illustrations depict the great variety of design and ornamental detail embraced by so simple a thing as a hoop for the finger. It would be easy to multiply the literary and the artistic branch of this subject until a volume of no small bulk resulted from the labour. Volumes have been devoted to the history of rings—Gortæus among the older, and Edwards,* of New York, among the modern authors. The ancients had their Dactyliotheca, or collection of rings; but they were luxurious varieties of rings for wear. The modern collections are historic, illustrative of past tastes and manners. Of these the best have been formed by the late Lord Londesborough (whose collection was remarkable for its beauty and value), and Edmund Waterton, Esq., F.S.A., who still lives to possess the best chronological series of rings ever brought together. We have had the advantage of the fullest access to each collection.

It is in the oldest of histories, the books of Moses, that we find the earliest records of the use of the finger ring. It originally appears to have been a signet, used as we now use a written autograph; and it is not a little curious that the unchanged habit of Eastern life renders the custom as common now as it was three thousand years ago. When Tamar desired some certain token by which she should again recognize Judah, she made her first request for his signet, and, when the time of recognition arrived, it was duly and undoubtedly acknowledged by all.† Fig. 1 exhibits the usual form assumed by these signets. It has a somewhat clumsy movable handle, attached to a crossbar passing through a cube, engraved on each of its facets with symbolical devices. Sir John Gardner Wilkinson speaks of it as one of the largest and most valuable he has seen, containing twenty pounds worth of gold. "It consisted of a massive ring, $\frac{1}{2}$ an inch in its largest diameter, bearing an oblong plinth, on which the devices were engraved, 1 inch long, 6-10ths in its greatest, and 4-10th's in its smallest breadth. On one face was the name of a king, the successor of Amunoph III., who lived about B.C. 1400; on the other a lion, with the legend 'lord of strength,' referring to the monarch; on one side a scorpion, and on the other a crocodile."

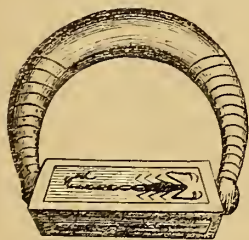


FIG. 1.



FIG. 2.

Judah's signet was, of course, formed of less valuable material, and had, probably, a single device only. The lighter kind of hooped signet, as generally worn at a somewhat more recent era in Egypt, is shown in Fig. 2. The gold loop passes through a small figure of the sacred beetle, the flat under side being engraved with the device of a crab. It is cut in carnelian, and once formed part of the collection of Egyptian antiquities gathered by our consul at Cairo, Henry Salt, the friend of Burckhardt and Belzoni, who first employed the latter in Egyptian researches, and to whom our national museum owes many of its chief Egyptian treasures.

From a passage in Jeremiah (xxii. 24) it appears to have been customary for the Jewish nation to wear the signet ring on the right hand. The words of the Lord are uttered against Zedekiah—"Though Coniah, the son of Jehoiakim, King of Judah, were the signet on my right hand, yet would I pluck thee thence."

The transition from such signets to the solid finger ring was natural and easy. The Biblical record treats them as contemporaneous even at that early era. Thus the story of Judah and Tamar is immediately followed by that of Joseph, when we are told "Pharaoh took off the ring from his hand and put it upon Joseph's hand," when he invested him with authority as a ruler in Egypt. Dr. Abbott, of Cairo, obtained a most curious and

valuable ring, inscribed with a royal name. It is now preserved, with his other Egyptian antiquities, at New York, and is thus described in his catalogue:—"This remarkable piece of antiquity is in the highest state of preservation, and was found at Ghizeh, in a tomb near that excavation of Colonel Vyse's, called 'Campbell's Tomb.' It is of fine gold, and weighs nearly three sovereigns. The style of the hieroglyphics is in perfect accordance with those in the tombs about the Great Pyramid, and the hieroglyphics within the oval make the name of that Pharaoh (Cheops) of whom the pyramid was the tomb." Fig. 3 represents this ring, and beside it (Fig. 4) is placed the hieroglyphic inscription upon the face of the



FIG. 3.



FIG. 4.

ring, which is cut with the most minute accuracy and beauty. Rings of inferior metal, bearing royal names, were worn, probably, by officials of the king's household. Henry Salt had one such in his collection, which was afterwards in the remarkable collection of rings formed by the late Lord Londesborough. It is represented in Fig. 5, and is entirely of bronze. The name of Amunoph III.



FIG. 5.

is engraved on the oval face of the ring, exactly as it appears on the tablet of Abydos in the British Museum. Amunoph (who reigned, according to Wilkinson, B.C. 1403-1367) is the same monarch known to the Greeks as Memnon; and the colossal "head of Memnon," placed in the British Museum through the agency of Mr. Salt, has a similar group of hieroglyphics sculptured on its shoulder. There was another kind of official ring, which we can recognize from the description of Pliny, and of

which we give an engraving (Fig. 6) from the original, in the author's possession. It is of bronze, and has engraved upon its face the figure of the scarabæus; such rings were worn by the Egyptian soldiers. The lower classes, who could not afford rings of precious metals, but, like their modern descendants, coveted the adornments, purchased those made of ivory or porcelain. In the latter material they abounded, and are found in Egyptian sepulchres in large quantities; they are very neatly moulded, and the devices on their faces, whether depicting gods, emblems, or hieroglyphics, are generally well and clearly rendered. This fondness for loading the fingers with an abundance of rings is well displayed on the crossed hands of a figure of a woman (Fig. 7), upon a mummy case, in the British Museum. Here the



FIG. 6.

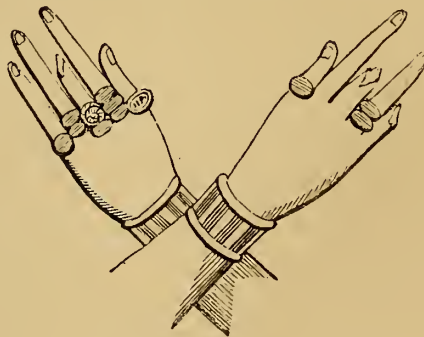


FIG. 7.

thumbs, as well as the fingers, are encircled by them. The left hand is most loaded; upon the thumb is a signet with hieroglyphics on its surface, three rings on the forefinger, two on the second; one formed like a snail shell, the same number on the next, and one on the little finger. The right hand carries only a thumb ring, and two upon the third finger. These hands are cut in wood, and the fingers are partially broken. Wilkinson observes—the left was considered the hand peculiarly privileged

* "History and Poetry of Finger Rings."

† Genesis, chap. xxxviii.

to bear these ornaments, and it is remarkable that its third finger was decorated with a greater number than any other, and was considered by them—as by us—par excellence, the ring finger; though there is no evidence for its having been so honoured at the marriage ceremony." Herodotus narrates a curious antique legend he obtained in Egypt concerning the ring of Polycrates. It is remarkable as having spread into the legendary history of all countries, being still credited by the commonalty. We shall have hereafter to note its existence as an old London tradition; but the version of the Greek historian is briefly this:—Amasis, King of Egypt, conceived an extraordinary friendship for the Greek, Polycrates, and, observing that the latter was attended by unusual success in all his adventures, reflected that such unvarying felicity seldom lasted through life, and the end of such a career was often calamitous. He, therefore, advised him to propitiate future fortune by seeking some object whose loss would produce most regret, and voluntarily casting it away from him where it could never be recovered. Polycrates attached most value to a signet ring he constantly wore; it was of gold, set with an emerald, but by Theodorus, of Samos, a famed engraver of gems. He went out in a galley, far on to the open sea, and then cast his precious ring into its water, returning in an excess of grief. Some six days afterwards a fisherman came to his gate, bearing a fish so fine and large he deemed it to be only fited for the table of Polycrates. The King of Samos accepted the gift, the fish was sent to the royal kitchen, and on opening it a valuable ring was found in its stomach. It was at once taken to Polycrates, who immediately recognized his abandoned treasure, which he now valued the more as it seemed to be returned by divine interposition. In the comparatively modern era of Roman rule in Egypt rings of fanciful construction were occasionally worn. In the British Museum is a remarkable one (Fig. 8) having the convolutions of a serpent, and the head of Serapis at one extremity, and of Isis at the other; by this arrangement one or more of



FIG. 8.

them would always be correctly posited. It has also the further advantage of being flexible, owing to the great sweep of its curve.

(To be continued.)

THE CLOCK AND CHIMES AT LIGHTCLIFFE CHURCH.—The clock and chimes which are now fixed in the tower of the church at Lightcliffe, have been presented by Mr. Ripley, M.P., and the whole work has been entrusted to Messrs. Gillett & Bland, Steam Clock Factory, Croydon. The clock is fixed in the chamber below the bells, and strikes the hours upon a bell of 18 cwt. with a hammer of 58 pounds, and chimes the four quarters on six bells, a different chime for each quarter. The time is shown upon four dials, each 4 ft. 8 in. in diameter; they are made of iron, all cast in one piece, in the skeleton form, projecting from the face of the tower several inches, and in the centre is a representation of the sun, which is gilt, the figures and minutes being also gilt. The clock frame is of massive cast iron, on the horizontal plan, all cast in one piece, and so made that any wheel can be taken out separately without disturbing the other parts. The clock altogether is 6 ft. long, 3 ft. in height, and 2 ft. 6 in. wide, and it weighs altogether about one and a half tons. The escapement, which is singularly delicate and effective, is the invention of Sir Edmund Beckett, Q.C., and is technically termed the "Double three-legged gravity." It has considerable advantages over the ordinary "dead beat" and other escapements, and it is said that clocks made in this way are capable of keeping much better time. The pendulum (instead of the usual wooden rod) is a compensated one, made with zinc and iron tubes, and has a cylindrical bob at the bottom weighing over 2 cwt. The motive power is given to the clock by weights, of about one ton, suspended from cast-iron barrels by steel wire lines, altogether 450 ft. in length. All the wheels are of the best gun metal, beautifully polished and cut. The bearings for the pivots to run in are also of gun metal. There are two engraved and silvered dials on the clock showing minutes and seconds for the purpose of regulating and adjusting the outer hands, and for taking observations. There is also an apparatus fitted up in the ringing-room for pulling off all the hammers from the bells simultaneously before commencing ringing, so as to prevent the possibility of their being knocked off by the ringers. The workmanship and materials of the clock are of the very best description, and the inhabitants of Lightcliffe can now boast of having one of the finest public clocks in this part of the country.—Bradford Observer.

ANCIENT BROOCHES AND DRESS FASTENINGS.

From "Rambles of an Archaeologist."

EVERY artist who paints an historical picture knows the difficulty of obtaining the necessary *minutiae*, in order to give *raisemblance* to his picture, as the authorities are widely scattered, and can only be brought together by those who know where to look for them, for often they lie hidden in illuminated MSS., or in books of considerable rarity, seldom looked at by the general reader, and only fully appreciated by literary men and students. We propose to show how varied and curious the history of any article of dress becomes if studied carefully, and how such minor details indicate clearly defined periods, as faithfully as any other historic data.

The use of the fibula, or brooch, was, in all probability, first adopted by men to secure the outer cloak upon the shoulders. It originated among the ancient Greeks, and appears to have been considered as a characteristic of Greek costume, even after it had long been adopted by the Romans, as may be understood from a passage of Suetonius, in his life of Augustus, "He distributed among various other persons, *toga* and *pallia*, and made a law that the Romans should wear the Greek habit, and the Greeks the Roman habit," that is, that the Greeks should wear the *toga*, and the Romans the *pallium*. Now, though it is certain that the *pallium*, or cloak, was peculiar to the Greeks, and that many authors, besides Suetonius, testify the same, yet it is as evident that this article of dress became afterwards the common habit of Greeks and Romans. The earliest form in which we meet with a fibula, is that of a circular disc, having a pin cross-



FIG. 1.

ing it behind, which passed through the folds of the cloak, and was hidden from sight by this outer disc. It retained that form for ages, and is rarely seen upon antique monuments in any other shape. It is very clearly represented upon the statue of Paris, as shown in Fig. 1. It will be seen that the cloak covered the left arm, the opening being upon the right one, where the brooch reposed on the shoulder, leaving the right arm free. There is a very beautiful and well-known antique statue of Diana, representing the goddess fastening her mantle in the same manner. The character of this outer garment varied with the seasons, but whether heavy and warm, or light and cool, it was usually plain in its character, or simply decorated with a border and corner ornament. Sometimes, when worn by great personages, it appears to have been decorated with needle-work, and shot with threads of gold. Such a one is described in the "Odyssey" (Book xix.), as worn by Ulysses:—

"In ample mode

A robe of military purple flowed
O'er all his frame: illustrious on his breast
The double-clapping gold the king concest.
In the rich woof a liond, mosaic drawn,
Bore on full stretch, and seized a dappled fawn:
Deep in the neck his fangs indent their hold,
They pant and struggle in the moving gold."

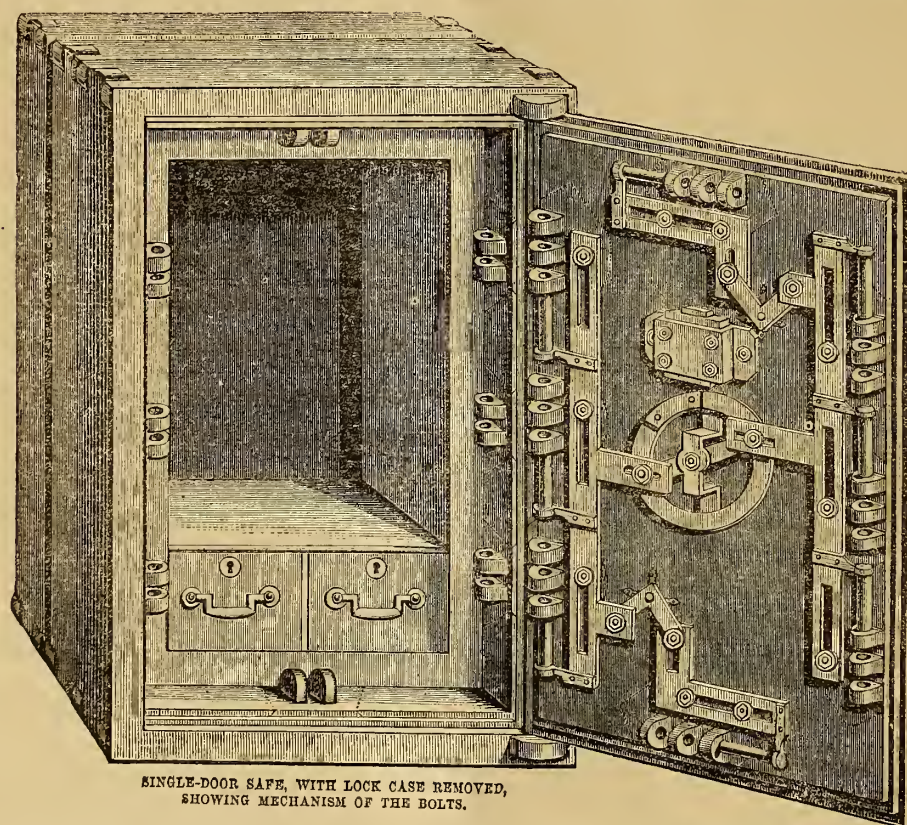
When the brooch secured the short military cloak of the Romans, it was usually worn in the centre of the breast. As the desire for personal display increased, a brooch was worn on each shoulder, the ladies often wearing a row of them to close the sleeve left open down the arm. Occasionally they were also used to fasten the tunic above the knee, in

the way that Diana appears to have secured hers before she indulged in the chase. As luxury increased in the Roman empire, these articles of utility became also ornaments of much cost and splendour. The art of the goldsmith was devoted to enrichments for them, that of the enameller to brilliant colouring. They increased in size greatly, and became distinctive of rank and wealth. The influence of Eastern taste, when the seat of royalty was transferred from Rome to Constantinople, was visible in the jewellery afterwards usually worn; nor was the taste confined only to the fair sex, the men in the East being still as fond of jewellery as the ladies of the harem.

(To be continued.)

"I MAK SICKER."

THIS is the motto of an ancient Scottish family, the meaning being "I make sure," and, as showing how the old can be applied to the new, the word "sicker" has been taken as the name of the latest "safe" candidate for public patronage. We had lately an opportunity of examining this safe and taking note of its principle of construction. Many of our readers will remember seeing the huge sicker safe, which was lent for use in last and the previous years' International Exhibition at South Kensington, where it occupied a conspicuous position in the southern annexe. It is our invariable rule, in reviewing any manufacture, to carefully avoid giving our remarks the taint or possible construction of a "puff." We shall, therefore, in speaking of this subject, which is one of weighty importance to the trades we represent, be scrupulously tenacious in the observance of this rule. The mechanism and construction of the patent is remarkably simple, and with a few details, aided by the engraving, our readers will, we feel sure, arrive at a just and fair opinion on the merits of a novelty which has certainly called forth very considerable approval in the mechanical world.



SINGLE-DOOR SAFE, WITH LOCK CASE REMOVED,
SHOWING MECHANISM OF THE BOLTS.

The bodies or walls of the safes are composed of alternate plates of iron and drill-proof steel, united by serews and cone-shaped rivets through holes countersunk on both sides. The bodies are united at their angles by similar fastenings, but passing in addition through heavy angle iron. Round the back and front are broad bands with bevelled edges, to frustrate the use of a cramp. The doors are composed of three plates, the centre one being drill-proof steel, united similarly to the bodies. These plates are graduated in size correspondingly with the two wedge bars round the facing of the frame. The steel is impenetrable under a Whitworth's steam-drilling machine with a pressure of half a ton.

We have thus described the features of the sicker safes so far as relates to drilling, or separating their bodies by means of prising, and now come to that most formidable, which "with a fulcrum would raise the world," the lever, or more familiarly known as the "wedge." It was this tool which enabled the valuable chronometers and jewellery to find their way into the fiddle-cases of the "Caseley gang" to the tune of many thousand pounds' loss to Mr. John Walker, of Cornhill, London. It is this tool to which numerous, otherwise good, safes have yielded. The absolute defeat

of this tool is the special object of the Sicker patent, whether applied to safes, deed chests, or strong rooms. To explain the principle of mechanism we cannot do better than avail ourselves of the lucid description thereof given by the *Engineer* :—

"On the inner face of the framing of the safe, and upon its four sides, are a series of pierced knuckles, and these pierced knuckles have the same general figure of one-half of the joint of a door or butt hinge. On the inner face of the door of the safe there is placed a series of other pierced knuckles having the same general figure as the other half of the joint of a door or butt hinge. The knuckles on the door are fixed in such positions that when the door is closed they engage respectively with the knuckles on the framing of the safe. When each pair are thus engaged together they resemble the joint of a hinge, excepting that there is no pin or axis passing through them. On the inside of the door is a series of sliding bolts, and these bolts carry pins or axes. Connected with these bolts is mechanism which, on the turning of the knob or handle of the safe door, can be made to shoot forward the pins or axes into the openings in the engaged knuckles, and thereby join them together as the knuckles of a hinge are joined together by their pins or axes. When the pins or axes are in their shot or advanced position they securely fasten the door, whether it be of a safe or of a strong room. To withdraw the pins and thereby unfasten the door, the handle, whose movement in one direction shot them, has merely to be turned in the opposite direction.

"The mechanism by which the bolts are actuated may either consist of a series of levers worked from the spindle, from the knob or key of the safe door gearing with the bolts described, or the bolts may gear with a toothed wheel on the spindle and the knob; or again, the bolts may be connected together by chains set so that by operating on one or more of the bolts the whole series are actuated. At present the inventor shoots or withdraws the bolts by a mechanism which may be thus described. On the longer sides of the inner face of the door, and parallel therewith, there work vertical sliding bolts, and near the top and bottom of the door horizontal sliding bolts also work. These bolts are geared together by cranked levers turning on centres. The vertical bolts carry a series of pins for entering the openings in the engaged knuckles on the sides of the safe and door; and each of the horizontal bolts carries its pin for entering the openings in the engaged knuckles on the top and bottom of the safe and door. As may be imagined, the pins are situated in a line with the respective openings in the knuckles into which they are to enter. The bolts are shot and withdrawn by means of a centre wheel which communicates with the knob or handle outside. The spindle of the knob is carried by the cross-bar on the wheel, and the wheel is connected with the vertical bolts by cross-bars or levers. The sliding bolts are guided so as to move in a rectilinear direction by the tops of the arm carried by the base plates of the cross-bar engaging in slots in the sliding bolts. The tops of the arms are secured in the slots by screws and washers.

"When the door has been closed, and the handle so turned as to shoot the pins into the knuckles, the wheel is fastened in its shot position by means of a lock placed above it, whose bolt shoots down and engages with stops or shoulders on the wheel."

It will thus be seen that each pair of knuckles or lugs forms five distinct fastenings, and as there are eight pairs employed on the safe we illustrate, the bolts have forty interlacings alternately between the door and body of the safe. The base plates of the lugs are dovetailed and counter-dovetailed, and they are so inserted in slots that prising or leverage could only tighten them, and to force them out of position by any external means would obviously be a mechanical impossibility. Another important feature of the safe is the lock, called the "Sicker Duplex" which is really two distinct locks in one. The locking of the first acts on the stop of the safe, the locking of the second throws a drill-proof steel plate over the keyhole of the first. It will therefore be apparent that the Sicker patent aims not only at remedying one or two known weaknesses in the construction of safes, but it boldly asserts absolute security and frustrates any illicit attack which can be contemplated. The safes are supplied with a most perfect system of fire-proofing upon the steam-generating principle. The patent has now been before the public about three years, and we are informed that it has already so established itself among banking, jewellery, bullion, and other mercantile firms that the demand for it has far exceeded the capacities of supply, and consequently has led Mr. J. Felton Elwell, the patentee, to form his business into a limited company, as "The Sicker Safe and Strong Room Company, Limited." The directors are at present erecting works at Soho, Birmingham, adjoining the station on the London and North Western Railway, which, when complete, will form one of the most extensive manufactories of safes in the kingdom. We may have occasion at a future date to give our readers a description of this manufactory, and the labour-saving machinery which will be employed there, the subject of an absolutely secure safe being one worthy of all consideration.

BOOK NOTICE.

A Treatise on Watchwork, Past and Present. By the Rev. H. L. NELTHROPP, M.A., F.S.A. With Illustrations. London: Spon, Charing-cross.

THIS book, of some three hundred and odd pages, is the production of an enthusiastic amateur; that is, of a gentleman who does not follow watchmaking as a profession or calling. The author says that the difficulty of the student in obtaining the requisite information has induced him to devote a portion of his leisure time to the volume before us. Productions of the scientific, or the practical and scientific kind, could not be in better hands than those of a clergyman, with leisure time, who possesses the fire within and the means to keep that fire burning. A clergyman is always a highly-educated person, and if he resides in a quiet part of the country, far removed from the din and social war of cities, with no care about the provision of Sunday dinner or the quarter's rent, his leisure time is leisure time indeed. When he directs such time in the path of practical science, we venture to affirm that he is conferring a far greater benefit upon his countrymen than in giving utterance to any quantity of wretched wrangling about "positions," "interpretations," and all the mud-spattering of the miserable *odium theologicum*. The author very truly says, in his preface, that, with the exception of the rudimentary treatise, reviewed in our last number, no one has ventured of late to treat on horology. He speaks of the French as being much ahead of us in such matters; but, as the books are both scarce and dear, they are beyond the reach of wages-earning people; to supply such a deficiency is the object of the book before us.

We think that we can afford good reasons why such literature is so comparatively scarce with us. In the first place, working watchmakers, as may be expected, have not the necessary literary ability to write books. A man who begins to learn his trade at fourteen years of age, after having served seven years at the bench, is not very likely to be able (or to have the opportunity) to undergo a grammatical training. True, there have been exceptions; but those exceptions have mostly had their bread buttered on both sides in some other way. Royal personages have written books, composed music, and even made excellent fiddlers—the latter, to the unbounded delight of Jack afloat. But, then, as we have said, their bread was buttered on both sides in another manner, and they could, therefore, follow the bent of their several inclinations. Again, horological literature does not pay the hand-to-mouth man. If the writer has a handle to his name, moves in the society of the upper classes, and can guarantee his publisher against loss, then

we say, that, with a good book, it will pay him, and very likely pay him well in the long run. One good method of turning out a new standard work would be, for the man of experiment and practice to make his notes and carefully go over them with the man of horological literary power, and see what they could bring forth between them; immediate, or, indeed, any pecuniary recompense being pushed entirely out of sight. We strongly believe that Reid's celebrated book was produced in this way, and a good way, too.

Mr. Nelthropp begins at the beginning by telling what a watch is, the definition of trade-terms, followed by no fewer than fifty-three illustrations of a watchmaker's tools. We have a historical summary of the time-keeping business from the earliest period down to the present. We next pass on to the calculations of the numbers for wheels and pinions, taken and acknowledged from Reid's book; also a chapter on dial-wheels and motion-work. Then the several escapements are dealt with, all of which are pretty fully illustrated; and, further on, a few pages on repeating and keyless work. There is a good chapter on springing, and another on the jewelling of pivot-holes. The concluding chapters will be better understood by being read than by anything that we can say here. A few words about the choosing of a watch and selecting a good one would be greatly appreciated by the watch-buying community, if the watch-buying community could be induced to appreciate anything tending to its and our comfort and profit in the way of watch-work. Of the said community we verily believe that there is not more than 1 per cent. who knows how to wind up a watch properly, simple as such an act is. We have seen cooks wind up their roasting-jacks with a better knowledge of mechanical ways and means than many men their watches. When ignorant usage spoils the going, such men fly to the regulator, as if that was some unseen spirit whose touch would put their own blundering right. After playing at push and pull in this way for a week or so, off they rush to the watchmaker and unfold a list of woes enough to drive the poor man mad. Again, we have known people repeatedly leave their watches "to be seen to," when only winding-up was wanted. A most amiable, business-like gentleman of our acquaintance adopted the very profitable practice of charging half-a-crown for that operation, when nothing else was wrong. He mostly kept the instrument a couple of days or so before returning it to the delighted owner. A well-disseminated knowledge of the principles of watchwork would be very satisfactory to both the makers and wearers of watch-work. Mr. Nelthropp gives that information most fully.

The book finishes with the celebrated Lalande's "Treatise on Pitchings," which is added by way of appendix.

Taking the work altogether, there is a large amount of information in it, both for the practical man and the amateur, that has been most laboriously got together. It is well worth reading by every one who has any interest in either watches or watchmaking. Our advice is—Read it.

PICKPOCKETS IN FRANCE.—French pickpockets carry on their business with great system as well as great cunning. The following story is related in a French journal:—

"A physician officially connected with the prison of La Force, and much beloved by his light-fingered patients, perceived on leaving the Variétés one evening that his pocket had been picked, and that his opera-glass was gone. Next day, on meeting the denizens of La Force, he expressed his displeasure at the occurrence. 'It is all very well,' said he, 'for you to say I am popular among you, but I am treated just as others are. Some of your friends contrived to relieve me of my opera-glass last night at the Variétés.' 'That was only because they did not know you, doctor,' replied a prisoner. 'Who was on duty at the Variétés last night?' he inquired, turning to a comrade. The answer was given in a whisper. 'You shall have your glass to-morrow,' he added. Next day a person called on the physician's wife. 'Here,' said he, 'are all the opera-glasses stolen two nights ago at the Variétés; please to point out the doctor's.' The lady having done so, the obliging pickpocket handed it to her, restored the others to their cases, and disappeared."

It is related that upon one occasion, when Commodore Judkins was in command of the *Scotia*, a fussy little gentleman came to him just as the steamer was leaving Liverpool, and asked if he thought the *Scotia* would arrive in New York upon a certain day in time for him to catch the noon train for Philadelphia. Judkins looked at him a moment in silence, and then, taking out his watch, replied, "I fear, sir, we shall be five minutes too late!"

Greek was the first foreign language which Cato, the celebrated Roman censor, acquired, and which was accomplished in his old age.

THE QUEEN'S NECKLACE.

From "Temple Bar."

ALTHOUGH the story of the "Queen's necklace" has often been related, it still possesses a double interest. On the one hand we desire to know the whole truth about an affair which, by putting the honour of the beautiful Marie Antoinette in question, struck at the heart of royalty, and contributed to precipitate the Revolution. On the other hand, the trial which ensued exhibited men such as they were in public and private life previous to that epoch. The brilliant and corrupt society of the end of the eighteenth century is painted in bold relief in this drama—a drama more original and varied than the *Mariage de Figaro*, and one which has for its principal actors the Cardinal de Rohan, Madame de Lamotte, and the charlatan Cagliostro.

Louis de Rohan, Cardinal, Grand Almoner, Bishop of Strasbourg, Prince of the Empire, and member of the French Academy, the real hero of the piece, was penetrated as little as any man in France with the spirit of his position. Gallant, magnificent, of a noble figure and graceful manners, he pleased and surprised by his inconsistencies. "Il n'était rien de ce qu'il devait être; mais il était aimable autant qu'on peut être hors de sa place et de son caractère." Such is the description given of him by Madame de Genlis. Under an agreeable exterior, however, ragged a wild ambition and the fiercest passions, without principle or curb to restrain them. He had, moreover, wit and learning, and possessed a taste for the occult sciences. Of his embassy to Austria on the partition of Poland, no other souvenir remains than his pomp, his debts, and his public gallantries with the ladies of the court and others less distinguished. It is related of him at Vienna that, on the anniversary of the fête Dieu, he threw into disorder, with his hunting retinue, a religious procession which he met on the way. Recalled at the instance of Maria Theresa, he fell into disgrace. Louis XVI. could not tolerate a prelate so scandalised by his habits; Marie Antoinette felt for him an aversion, mingled with contempt, which she was at no pains to disguise. The prince had begun to despair of ever emerging from this mortifying disgrace, when he met Cagliostro and Madame de Lamotte. At this period Cagliostro was as celebrated as Voltaire, and was talked about as much as Beaumarchais. He pretended to be the high-priest of a kind of natural religion, whose devotees were to be pure as the rays of the sun; and in order to protect themselves against calumny, they were to have neither wives nor light pleasures, nor a fortune of more than 50,000 francs. Nothing about him was wanting to excite astonishment and curiosity. Everything was bizarre and mysterious respecting his fortune, his birth, his manner of living, and his speeches. His success was prodigious. Fanaticism reached so high that not only was his portrait and that of his wife to be seen on fans, rings, snuff-boxes, and medals, but his bust was sculptured in marble, cast in bronze, and placed in the palaces of the noblest amongst the nobility. Under one of these busts this inscription, engraved in letters of gold, might be read, "The Divine Cagliostro." The greatest personages of the day, such as the Duke of Luxembourg, the Prince Soubise, were his familiars. The success of Cagliostro was a triumph for the Cardinal. He it was who had taken him by the hand, and as it were introduced him to the public. In his hôtel the most important and the most mysterious séances were held. He spoke of the great enchanter with respectful and eloquent admiration; an admiration which was not the effect of surprise and the illusion of a curiosity skilfully excited, but an admiration which existed for upwards of five years, and perhaps to the last, in the generous mind of the Cardinal.

Madame de Lamotte, the heroine of the drama, was descended, by Henry, Baron of Saint-Remy, from the royal house of Valois. It is not known by what means the family sank into their final degradation. It is related that the father of Madame de Lamotte, Jacques de Saint-Remy, was a man of athletic figure, who lived by hunting, by depredations in the forests, and even by stealing fruit; whilst his children, half-naked and neglected, depended on the charity of the villagers; that in 1760 Jacques de Saint-Remy determined to abandon Fontelle and go to Versailles to coin money, on the strength of his name of Valois; that on the night of his departure he suspended his second daughter, a baby in swaddling-clothes, at the window of one of the inhabitants of the place who had most enriched himself with the spoils of his ancient seigneurie; that taking with him only his parchments, he set out on foot, dragging with him his eldest daughter Jeanne, his son, and his wife; that he arrived ill at Boulogne; and that having excited the pity of the Baroness de Choiseul, was enabled to die in a comfortable bed at the Hôtel-Dieu. Abandoned shortly afterwards by her mother, the little Jeanne went

begging about the streets of Paris, crying, "Pity an orphan who is descended by the direct line from Henry II., king of France." One day, whilst selling flowers in the Champs Elysées, she attracted, it is said, the attention of the Countess of Boulainvilliers, the wife of the provost of Paris, who took her home, educated her, and obtained from the king for her and her sister a pension of 600 francs, and for their brother the Baron de Valois a pension of a thousand francs and a free admission into the Naval School. Subsequently she passed some time in the Abbey de Longchamps; but exhibited little taste for a convent life, even relaxed as was the discipline at the time. Shortly after she returned to Bar-sur-Aube, her native place, with her pension of 600 francs. There she met the Count de Lamotte, a handsome man, and of an honourable family, but with very equivocal pursuits, and steeped up to his ears in debt. To defray the expenses of the wedding, Mdlle. de Saint-Remy mortgaged two years' pension, whilst M. de Lamotte sold a horse and a carriage which he had bought on credit. Thus provided, they went to Paris to seek their fortune. Madame de Lamotte, who reckoned on the éclat of her name to obtain credit and favour, soon understood that, "in a country like France, there were only two ways of demanding alms: at the church-door, or in a carriage." Penetrating sometimes into good society, where she strove to form connexions; mingling occasionally with that crowd of petty intriguers who lived from day to day on imaginary credit and hung about the court, she attached herself to whatever might place her amongst this mendicant class. Into every hand she thrust her petition and knocked at every door; she sought and obtained an audience of the old Marshal de Richelieu. She went to Luciennes to introduce herself to Madame du Barry; prayed her to receive her as a companion; and placed in her hands a memoir which she had signed *Marie Antoinette de France de Saint-Remy de Valois, femme du Comte de Lamotte*. She wearied out with her solicitations the comptroller-general, the lieutenant of police, and the ladies who were said to be basking in the sunshine of the court, in order to obtain, if not useful assistance, at least some louis. One day she pretended to faint in the waiting-room at Madame Elizabeth's. Madame, informed that a lady of quality was dying of hunger in her ante-chamber, sent her maids-of-honour to her, gave her some money, and had her pension raised to 1500 francs. Madame de Lamotte, encouraged by this, tried on new games of the kind; but without success; for she was never admitted into the presence of the queen. Excited, sick with pride and envy, bitter against Marie Antoinette for not receiving her, devoid of any moral principle, it may easily be imagined what she became after two years of this life of flattery and prayers addressed in vain to the powerful, of continual affronts and a daily struggle against the pecuniary embarrassments which beset her. She lost, with the hope of succeeding by honest means, whatever modesty and scruples remained to her. As her mind grew profoundly morose, her natural talent for intrigue became thoroughly developed. She greedily received the thousand reports, true or calumnious, which were in circulation respecting the courtiers, and especially the Queen. She knew how a position might be made in the world by speculating on the weaknesses of the great; and she determined to profit by her knowledge. She had, in a word, all that was wanted to become a dangerous character, a *mauvaise citoyenne*; so much the more dangerous indeed because she was fascinating.

(To be continued.)

ALLEGED THEFT OF JEWELLERY.—On the 8th ult., a rather clever capture was made in Edinburgh of a lady and gentleman who are alleged to have endeavoured to carry off a diamond ring from a jeweller's shop in that city. It seems, says the *Glasgow Evening News*, that the gentleman, who gives the name of Miller, has been staying for two months in some of the best hotels in Edinburgh, and that he has been occasionally joined by a lady from Glasgow. They have gone to various jewellers in the city and made good purchases, and in the course of yesterday they went to Messrs. Hamilton and Crichton's, George-street, and asked for a sight of the diamond rings. On a case being shown to them, a shopman, it is said, observed the gentleman slip one of the value of 140*l.* into the sleeve of his coat, and substitute another worth only 10*l.* The shopman kept the visitors in play until two policemen arrived, and then said they must allow themselves to be searched. The gentleman at once put down the ring alleged to have been lifted, and he and the lady were marched off to the police office, where they were detained. The prisoners have a genteel bearing, and were dressed in fashionable style. At the Edinburgh Police Court the parties were remitted to a higher court on the charge of attempting to steal a diamond ring from the premises of Hamilton and Crichton.

CELEBRATED GOLDSMITHS OF OLDEN TIMES.

THE following account of the celebrated goldsmiths is from a plate of their arms in the Secretary's Office of the Goldsmith's Company, and may be interesting to our readers.

- 1100. Leofstane, Goldsmith, Provost of London.
- 1189. Henry Fitz Alwyn, Fitz Leofstane, Goldsmith, and Mayor of London.
- 1200. Ade, the King's Goldsmith.
- 1222. Itger, Goldsmith, Master of the Mint.
- 1258. William, the King's Goldsmith, Master of the Mint.
- 1275 to 1281. Gregory de Rokesby, eight times Mayor, Chief Assay Master of all the King's Mints in England.
- 1280. William Farringdon, Goldsmith, Sheriff of London.
- 1308, 1323. Sir Nicholas Farringdon, Goldsmith, Mayor four times.
- 1255. William de Gloucester, Goldsmith, Keeper of the Dies.
- 1276. Joice the Goldsmith, Keeper of the Dies.
- 1410. Sir Dru Barentine, twice Lord Mayor, died 1415, Foster Lane.
- 1415. William Fitzhugh, Goldsmith, Comptroller of the Mint.
- 1452. Humphrey Hayford, Goldsmith, Comptroller of the mint.
- 1485. Bartholomew Read, Goldsmith, Master of the Mint.
- 1527. Martin Bowes, Goldsmith, Master of the Mint.
- 1543. Sir Martin Bowes, five times Mayor, Goldsmith, Master of the Mint.
- 1545. Lawrence Warren, Goldsmith, Mint Assay Master.
- 1702-1722. Sir Francis Child, Goldsmith, Temple Bar, Mayor.
- 1712-1740. Paul de Lamerie, Crown Goldsmith.

ENGRAVERS TO THE MINT.

- 1100. Otto the elder and younger, Goldsmiths.
- 1150. W. Fitz Otho, Goldsmith.
- 1243. Richard Abel, do.
- 1265. Thomas Fitz Otho, do.
- 1280. Hugh Fitz Otho, do.
- 1290. Thomas Fitz Otho, do.
- 1294. William Fitz Otho, do.
- 1389. J. Edmund, do.
- 1422. Gilbert Van Brandenburg, Goldsmith.
- 1432. John Orewell, do.
- 1455. William Wodeward, do.
- 1461. German Lynch, graver of the puncheons.
- 1483. John Shaa.
- 1487. Nicholas Flynte.
- 1509. John Sharpe.
- 1520. Demaire.
- 1553. Deric Anthony.
- 1555. Vincentius.
- 1560-78. Deric Anthony.
- 1579. Manestrelle.
- 1612. John Dicker.
- 1611. Charles Anthony.
- 1628-36. Nicholas Briot.
- 1633. Edward Greene.
- 1646-49-58-72-74. Thomas Simon.
- 1648. Thomas Rawlings.
- 1672. James Roetier.
- 1672. Norbert Roetier.
- 1672. Philip Roetier.
- 1672. Joseph Roetier.
- 1674-88. John Roetier.
- 1672. Peter Blondeau, Engineer, his patent expired in 1688.
- 1615. Henry Harris.
- 1706-26-27. John Croker.
- 1706-26. Samuel Bull.
- 1706. Gabriel Clerk.
- 1727. John Rolles.
- 1737. Beresford.
- 1729-40. J. Sigismund Tanner.
- 1741, 1749. James Anthony Dassier.
- 1741. Richard Yeo.
- 1741, 1742, 1749. J. Ralph Ocks.
- 1742. John Tanner.
- 1764. Lawrence Natter.
- 1771. Thomas Pingo.
- 1779. Lewis Pingo.
- 1787. John Pingo.
- 1797. Nathaniel Marchant.

THE PRECIOUS STONES OF CEYLON.

(Continued from page 53.)

THE Moor traders are very expert in the manufacture of false gems. On the occasion of the building of a church in Kandy, a Moorman bought up all the broken coloured glass from the painted windows; and on being asked for what purpose, confessed that it was "to make precious stone for English steamer passenger at Galle." They also imitate the rough stones, and occasionally even deceive the more experienced. They are sometimes themselves taken in. On one occasion a Moorman endeavoured to induce one of a party of native diggers to sell him a sapphire surreptitiously, to which the Cingalese agreed; and the next day the Moorman came prowling about, and watching the digging and sifting, till a beautiful rounded blue stone appeared shining among the wet gravel; a bargain was struck with a few signs, and the money and stone exchanged with the utmost secrecy. The Moorman disappeared, to gloat over his knavery and his gains; but, to his dismay, found that his beautiful gem was a piece of roughed glass, which the Cingalese had provided himself with and quietly slipped into his basket.

The Ceylon ruby is seldom free from a tint of blue, and it is a remarkable fact that while the blue colour can be expelled from such stones by heat, the red colour is indelible, and the native jewellers avail themselves of this peculiarity to improve the colour of their rubies. It is very common to find stones one half blue and the other half colourless, and some have merely a crust of blue on one or more sides. The native lapidaries take advantage of this in cutting, and by leaving the coloured part on the under surface, form a foil which gives a fine blue to an otherwise valueless stone.

The opalescence above mentioned is found in rubies and sapphires as well as in topaz; it is worse than any flaw in depreciating their value; a crack or cavity can be cut out, but opalescence, which is most difficult to detect in an uncut stone, reveals itself in the cutting, and often runs in a pencil through the whole breadth or length of a gem, destroying its clearness and colour and rendering it comparatively worthless. When such stones are cut hemispherical *en cabochon* at a certain angle to the axis, they form the star stone, showing a star of six rays in a strong light. This is very pretty as a fancy stone, but is of no value as a gem.

We will now take a look at the proceedings of the native lapidary. His means and appliances are few, consisting of a pair of laps attached to spindles by a composition of rosin and sand melted together. One lap is of lead, on which pounded corundum or adamant spar is used for reducing the stones and shaping them in the rough. The other is of copper, for polishing the facets. Instead of diamond powder, they use for this purpose a fine silex extracted from the calcined husks of rice. The laps are lodged in a frame and worked by a bow. The native lapidaries use no gem pegs or mechanical instruments for regulating the angles, but work entirely by eye and touch, and it is wonderful the precision they attain, although it is difficult for them to bring the gems to a perfect level by hand, and consequently all native-cut stones are known by a slight bevelling of the facets. In the towns they have now adopted the European horizontal laps and fittings. The stone to be cut is fixed on the end of a stick with the same luting of rosin and sand, and applied by the left hand to the vertical plate, while the right hand works the bow.

In cutting a stone the natives sacrifice everything to size. Gems, to show their most beautiful light and colour, should be cut across the axis; but, as in most cases the stones are longest in the direction of the prism and pyramid, they cut them parallel to the axis, and their brilliancy is lost.

We have before noticed the combination of colours in sapphire—the Ceylon ruby being never found without a tint of blue. To expel this, when the stone is formed for polishing, it is rolled in a ball of wet lime and placed in a pan of charcoal, which is gradually raised to a white heat with a primitive bellows, or blowpipe, made of a tube of bamboo; after being kept at a white heat for about twenty minutes or half an hour, the ball is taken out and allowed to cool, and when broken open the stone will have lost the blue tint without injuring the crimson. By the same process, the tint of blue can be expelled from a stone which is nearly white; if, however, there is any crack or flaw in the stone it is liable to fly to pieces. It would be imagined that the natives discovered this evanescent quality of the blue colour by accident. We knew a gentleman who had been very successful in digging, and had a number of fine blue sapphires; unfortunately his bungalow was burnt down, and among the ashes of his furniture he found many of his gems, but all as white as glass, and their beauty lost for ever.

THE

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The attention of our readers, and the trade generally, is called to the form of subscription order, which will be found enclosed. When two or more copies are forwarded to one address, or in instances of subscription clubs being formed so that the copies for such club are sent to one person, a discount of 10 per cent. will be all well from the regular subscription rates, but in no instance will such deduction be made for subscriptions of less than one year.

THE STEREOSCOPE.

(Continued from page 77).

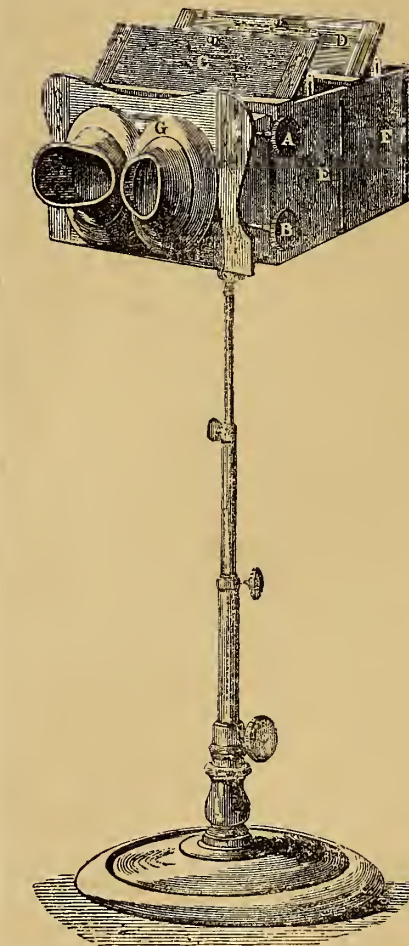
HAVING described the ordinary forms of the stereoscope, and endeavoured to render clear the principles upon which the stereoscopic effects depend, we may now pass to that form of the instrument known as the improvements of Mr. G. C. Cooke.

As these improvements have stood the test of time, and as the manufacturers, Messrs. NEGRETTI & ZAMBRA, so well known in connection with scientific instruments, have received nothing but praise of them, we cannot do better than append a descriptive account given thereof in the *Art Journal*:—

“The improvements made by Mr. Cooke are several, and we must endeavour to render them as intelligible as possible to our readers. Ordinarily, the stereoscopic lenses are placed in cylindrical tubes, without any arrangement, by which the eyes are left to view the picture undisturbed by the lateral rays which naturally fall upon them. Mr. Cooke applies to his stereoscope conical, or pyramidal, or trumpet-mouthed tubes for the eye-pieces, as shown

in the accompanying woodcut; by this arrangement the eyes are protected, the field of view is increased, and larger lenses than usual can be employed: therefore less impediment or obstruction than heretofore is offered to the rays emanating from the picture, and the eye of the observer is enabled to range more freely over the field of view. One difficulty has constantly presented itself in the use of the ordinary lenticular stereoscope. Whatever may be the conditions of vision, whether the observer had ‘long or short sight,’ the same lenses were used, and frequently the pictures were very imperfectly seen; and we are convinced that in many cases the stereoscopic effect was never seen at all—imagination, to some extent, supplying the deficiencies of the eyes or the instrument.

“In the new form of stereoscope we have the adaptation to the eye-pieces of additional movable lenses, adapted to different kinds of sight, for the purpose of assisting the



observer in viewing the pictures. These lenses are either meniscus, concave, plano-convex, or double-convex, as may be required; and they are adapted to the instrument in such a manner that they are moved into and out of use by means of small levers projecting through the sides of the box, as shown in the drawing. If thought desirable, these lenses may be coloured, or coloured glass may be similarly adapted to the instrument, so as to throw any particular tint or colour over the picture when viewing the same. By this arrangement the snowy appearances of some photographs are removed, and many charming effects may be produced—the golden glow of a meridian or of a tropical sun may be cast over the landscape, the roseate tints of a summer evening may be imitated, or we may look upon the grey valleys and the purple hills of the

gloaming of the autumn. Beyond this, such an arrangement presents to the philosopher the means of studying some of the laws of natural colouration in a manner—as it appears to us—far more satisfactorily than with the coloured spectacles of Wollaston or Herschel. These lenses or glasses, in Mr. Cooke's stereoscope, may either be placed immediately below the eye-pieces, as would be most desirable for persons having short or defective sight, or they may be placed about half way between the picture and the eye-pieces, as would be best if it be desired to magnify the picture. If magnifying lenses of short focal distance are employed, and placed immediately under the ordinary lenses, then the picture must be brought nearer to the eye, for which purpose a shelf or ledge, upon which the picture is placed, is adapted to the inside of the instrument. This arrangement is shown at the opening nearest the eye-pieces. In addition to this there is the adaptation, immediately above the space occupied by the picture, of a double *passe-partout*, or frame, for the purpose of preserving uniformity of size in the pictures, as well as to prevent any light from being reflected from their margin and confusing the eye.

"The arrangements which have been described open for the stereoscope a new epoch: the instrument is rendered effective for every pair of eyes, and all the adjustments are of the most simple kind, so that any person can at once readily obtain the conditions best suited to his circumstances of vision. The screen, or as the inventor calls it, the *passe-partout*, is a very ingenious and a most important introduction. With it in the stereoscope you look absolutely into a dark chamber, and see, in all the beauty of light and shadow, the picture you desire to see, and that alone; there is no intrusion of pieces of lateral images upon the stereoscopic one. The power of magnifying the picture is another improvement; and looking at the ordinary picture, and at it when magnified, the difference is such as can scarcely be understood unless it is seen. In one case we looked upon a champagne country, beautiful in all the effects of distance, but bounded by a band of indistinct hills; in the other, every tree put forth additional clusters of leaves, and the remote hills were developed in all their characteristic details. In one example a temple of Thebes was seen, and we were pleased with the truthful representation of ancient Egypt; while in the other we realized—which we had never done before—the colossal grandeur of those temples which were designed as emblems of eternal power, and to subdue the minds of the worshippers by the awful vastness of their sculptured columns. Hieroglyphics, which were but dimly seen in the smaller pictures, came forth distinctly in the larger one, and it required but small effort of the imagination to feel that you looked upon the actual ruin of a fane in which a Pharaoh had prayed to the mighty and mysterious Isis. For portraits, there is in this instrument a novelty; instead of looking on a miniature of our friends, there they are, in size and solidity, before us.

"After a most careful examination of all the conditions of Mr. Cooke's stereoscope, we are bound to state that it is by far the greatest improvement which has been made in this most interesting instrument."

POSSESSION OF JEWELLERY WITHOUT A SATISFACTORY ACCOUNT.—On the 30th ult. John Judge, described as a general dealer, of 6, Westminster-buildings, was charged, at the Clerkenwell Police-court, with being drunk and incapable of taking care of himself, at Blue Anchor-alley, St. Luke's, and with being in the possession of jewellery of the value of between 400*l.* and 500*l.*, and not giving a satisfactory account of the same. Police-constable Driver, 301 G, said on Wednesday evening he found the defendant in a helpless state of intoxication. As he had some parcels with him he took him to the police station. The next morning Inspector Peel asked the defendant what the parcels contained, and after some demur he said jewellery, and that he had purchased it at different places and at various times. The parcels contained silver watch-cases, signet rings, gold and silver rings, bracelets, gold and silver Albert chains, diamond rings, pebble eyeglasses, lockets, and other gold and silver articles of great value. The defendant, in reply to the charge, said that he could not deny that he was the worse for liquor. If time were given to him he should be able to give a proper account of where he had purchased the whole of the articles that were found in his possession. Mr. Barstow remanded the defendant for a week, and refused to take bail. The articles found on the prisoner may be seen at Old-street Police-station.

MRS. HERSCHEL, wife of Captain Herschel, F.R.S. (grandson of the celebrated Sir William Herschel), is now engaged on a memoir of Miss Caroline Herschel, the accomplished sister and assistant of Sir William, compiled from her own journals. Several letters of the great astronomer, hitherto unpublished, will be included in the volume.—*Athenæum*.

USEFUL HINTS TO GOLDSMITHS, JEWELLERS, AND OTHERS.

VALUABLE RECEIPTS FOR GOLDSMITHS.

STANDARD gold is compounded of 440 grains of fine gold, and 40 grains (Troy weight), to the oz. alloy; therefore, when you judge how much gold a piece of work will take, compound it to the standard weight by the following directions:—*Assay Weight*—The weight of gold is a pound, which is divided into 12 ozs., each oz. into 24 carats, each carat into 4 grains, and, lastly, each grain into 4 quarters; then you see the assay quarter-grain is in reality $1\frac{1}{4}$ grain Troy.

ON MELTING AND REFINING.

In melting *Brass Gold*, urge the fire to a great heat, and stir the metal with the long stem of a tobacco pipe to prevent honey-combing. If steel or iron filings get into gold while melting, throw in a piece of sand over the size of a common nut; it will attract the iron or steel from the gold into the flux, or sublimate of mercury will destroy the iron or steel. To cause gold to roll well, melt with good heat, add a teaspoonful of sal ammoniac and charcoal, equal quantities, both pulverized, stir up well, put on the cover for 2 minutes, and pour.

TO REFINER SWEEPINGS CONTAINING GOLD OR SILVER.

To 8 ozs. of the dirt, which has been washed and burnt, add salt 4 ozs.; pearlash 4 ozs.; red tartar 1 oz.; saltpetre $\frac{1}{2}$ oz., mixed thoroughly in a mortar, melt in a crucible, and dissolve out the precious metals in a button.

TO FUSE GOLD DUST.

Use such a crucible as is generally used for melting brass; heat very hot; then add your gold dust mixed with powdered borax; after some time a scum or slag will arise on the top, which may be thickened by the addition of a little lime or bone ash. If the dust contains any of the more oxidizable metals, add a little nitre, skim off the slag or scum very carefully; when melted, grasp the crucible with strong iron tongs; and pour off immediately into cast iron moulds, slightly greased. The slag and crucibles may be afterwards pulverized, and the auriferous matter recovered from the mass through cupellation by means of lead.

AMERICAN FASHIONS.

From the "New York Jeweller's Circular."

AMBER jewellery is much sought after.

LOCKETS are universally worn; the newest designs are heavy and expensive, precious stones being extensively used for ornamentation. INTAGLIOS are becoming quite popular. They are cut in or hollowed out of stone so that an impression taken therefrom would present the appearance of a bas-relief, the reverse of a cameo.

PASTE diamonds in silver mounting, designed for belt, shoe, and other buckles, that used to delight the hearts of our great-grandfathers, are coming into fashion, and may be seen in the cases of the leading retail jewellers.

TOOL FOR MEASURING LEVER ESCAPEMENTS.

MR. SAMUEL JACKSON, vice-president, has placed at the disposal of the council of the British Horological Institute the sum of 5*l.* 5*s.* as a premium for the best instrument or measuring tool for easily testing the completed lever escapement, the amount in degrees of impulse and locking angles, also the ultimate arc of escapement.

The council therefore invite competition for this prize. The instruments must be left at the institute not later than April 1st, 1876.—*Horological Journal*.

ACKNOWLEDGMENT.—We have to acknowledge the kind courtesy of Messrs. Longman & Co., Spon & Co., Negretti & Zambra, and Virtue & Co., for use of blocks for illustrated articles.

BOOKS AND MAGAZINES RECEIVED.—"Grammar of Colouring," by Ellis A. Davison. Lockwood & Co., Stationers' Hall-court. The *New York Jeweller's Circular*. The *Horological Journal*; and usual monthlies.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical goods, or kindred articles.

3183. JOSEPH PEARSON, of Birmingham, in the county of Warwick, Pattern Maker, for an invention of "Improvements in fastenings for solitaires, sleeve links, shirt and other studs, purses, bags, and other like articles."—Dated 11th September, 1875.
3226. LOUIS MARIE DETENRE, of the city of Paris, in the republic of France, Gentleman, for an invention of "Improvements in the manufacture of imitation steel ornaments and jewellery."—Dated 15th September, 1875.
3227. LOUIS MARIE DETENRE, of the city of Paris, in the republic of France, Gentleman, for an invention of "Improvements in the manufacture of imitation jewellery set with stones."—Dated 15th September, 1875.
3238. EPHRAIM SMITH, of Carlisle-street, Soho, in the county of Middlesex, for an invention of "An improved snap or fastener for bracelets, necklets, and other ornamental and useful articles."—Dated 16th September, 1875.

Notices to Proceed.

1852. RICHARD WHITTAKER, of 8, Eaton-grove, Dacre-park, Blackheath, London, has given notice in respect of the invention of "Keyless-going barrel watches."
2052. MATTHIAS PETERSEN, of Altona, Prussia, has given notice in respect of the invention of "An improved chronometer escapement."
2869. JAMES MUIRHEAD, of Glasgow, in the county of Lanark, North Britain, has given notice in respect of the invention of "New or improved studs for fastening sleeves, shirt-fronts, and which may be used for other similar purposes."
2874. CARL LEONARD HERMAN LAMMERS, of Gosforth, in the county of Northumberland, has given notice in respect of the invention of "Improved apparatus for indicating time in different localities or positions."

Patents Sealed.

765. JOHN HENRY JOHNSON, of 47, Lincoln's-inn-fields, in the county of Middlesex, Gentleman, for an invention of "Improvements in snap-hooks."—A communication to him from abroad by Francis C. Nye, of New York, in the United States of America.—Dated 2nd March, 1875.
985. FREDERICK MARMADUKE MARSDEN, of Henham Villa, Lee-road, Blackheath, in the county of Kent, for an invention of "Improvements in button fasteners, and in apparatus for attaching the same."—Dated 17th March, 1875.
1245. JOHN JOSEPH WAINWRIGHT, of Birmingham, in the county of Warwick, Merchant and Manufacturer, for an invention of "A new or improved watchman's detector."—Dated 6th April, 1875.
1324. FRANZISCUS XAVER FERDINANDUS HELLBOURN, of Birmingham, in the county of Warwick, Jeweller, for an invention of "A new or improved spring earring."—Dated 12th April, 1875.
2501. FREDERIC NIBLETT, of Hammersmith, in the county of Middlesex, for an invention of "Improvements in safes, strong-rooms, and similar structures for containing valuable property and in fastenings for the same."—Dated 12th July, 1875.

Grants of Provisional Protection for Six Months.

2917. To ALFRED JOHN HIGHAM, of 13, Blackheath-terrace, Blackheath, in the county of Kent, Gentleman, for the invention of "Improvements in clocks and other timekeepers."
2921. To JOHN HENRY JOHNSON, of 47, Lincoln's-inn-fields, in the county of Middlesex, Gentleman, for the invention of "Improvements in electric clocks or clock-work."—A communication to him from abroad by Emile Johanni Gondolo, of Paris, in the republic of France.
2970. To ELIJAH ATKINS, of Birmingham, in the county of Warwick, Manufacturer, for the invention of "Improvements in solitaires, sleeve-links, and other like articles."
2985. To WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton-buildings, London, for the invention of "Improvements in watches and similar timekeepers."—A communication to him from abroad by Alfred Henry Potter, of Chicago, Illinois, United States of America, Watch Manufacturer.
2986. To JAMES MALLINSON, of Welwyn, in the county of Herts, for the invention of "Improvements in cocks and in sluice and slide valves to regulate the flow of steam, water, and other fluids."
3118. To BENJAMIN JOSEPH BARNARD MILLS, of the firm of Harris and Mills, of 23, Southampton-buildings, in the county of Middlesex, Patent Agent, for the invention of "Improvements in watches."—A communication to him from abroad by Henri Jacot-Burman, of Bienne, in the Canton de Berne, in the Swiss Confederation.
3233. To EPHRAIM SMITH, of Carlisle Street, Soho, in the County of Middlesex, for the invention of "An improved snap or fastener for bracelets, necklets, and other ornamental and useful articles."

Patents which have become Void.

LETTERS PATENT for INVENTIONS which have become VOID by reason of the Non-payment of the additional Stamp Duty of 50*l.*, before the Expiration of the Third Year from the date of such Patents, pursuant to the Act of the 16*th* Vict., c. 5, sec. 2, for the week ending the 18th day of September, 1875.

2713. EDWARD HAWKINS, of Warren-street, Fitzroy-square, in the county of Middlesex, for an invention of "Improvements in compensating balances for chronometers, applicable also to other timekeepers."—Dated 13th September, 1872.

LETTERS PATENT for INVENTIONS which have become VOID by reason of the Non-payment of the additional Stamp Duty of 100*l.*, before the Expiration of the Seventh Year from the date of such Patents, pursuant to the Act of the 16*th* Vict., c. 5, sec. 2, for the week ending the 18th day of September, 1875.

2822. MATTHEW AUGUSTUS SOUL, of 3, Leadenhall-street, in the city of London, Patent Agent, for an invention of "Improvements in spring pendulums for chronometers and clocks."—A communication to him from abroad by Christian Johann Heinrich Carl George Augustus Voss, and Walter James Monnington, both of the city of Hamburg.—Dated 14th September, 1868.

Patents Granted in British India.

26. JOHN TIDMARSH, of 3, Wellesley-place, in the town of Calcutta, Optician and Watchmaker, in the employment of the firm of Messrs. Madeley & Company, of the same place, Opticians and Jewellers, for an invention of "Ascertaining the sight of any person, and selecting lenses, pebbles, and glasses of the proper focus for spectacles and eye-glasses, and called 'Tidmarsh's sight measure.'" Dated 29th May, 1875.

Patents Granted in Foreign States.

FRANCE.

- 106,292. TURIN, of Bony-Luxembourg, for "An almanac clock."—Dated 20th January, 1875.
- 106,452. REGNAULT, of Besançon, for "A metallic composition imitating gold, requiring no gilding and withstanding atmospheric action."—Dated 29th January, 1875.
- 106,559. AVRIL, of Nancy, for "A machine for polishing watch-glasses."—Dated 18th February, 1875.
- 106,570. FOURNIET, for "Manufacturing metallic ornamental hoops for jewelry."—Dated 2nd February, 1875.
- 106,581. PETERSEN, for "A so-called 'German escapement for chronometers.'"—Dated 26th January, 1875.
- 106,585. RIOTTOR, for "Improvements in the construction of so-called 'telescopic pencil-cases.'"—Dated 26th January, 1875.

(Certificate of Addition.)

- 105,230. LION and GUICHARD, for "A compensated aneroid barometer."—Dated 18th January, 1875.

PRUSSIA.

14. M. PETERSEN, of Altona, for "An escapement for chronometers."—3 years.—Dated 16th August, 1875.

BELGIUM.

- 37,652. C. ROULINA, for an imported invention of "A machine for rough-cutting diamonds."—Dated 13th of August, 1875.—(French Patent, 24th July, 1875.)
- 37,655. E. J. GONDOLO, for an imported invention of "Improvements in electric clocks."—Dated 14th August, 1875.—(French Patent, 20th April, 1875.)
- 37,734. V. HEINEN, of Liège, for "An apparatus for forging the small teeth of gearings for watches."—Dated 25th August, 1875.
- 37,820. L. M. DEFENRE, for an imported invention of "Manufacturing trinkets imitating steel, by stamping."—Dated 6th September, 1875.—(French Patent, 14th August, 1875.)

UNITED STATES.

6310. JAMES H. BOYD, of Chicago, Ill., for "Furnaces for reducing ores of precious metals."—Patent No. 144,184, dated 4th November, 1873.—Application filed 8th January, 1875.
- 165,746. WILLIAM H. MCCOY, of Des Moines, Iowa, for "Sundials."—Application filed 10th September, 1874.
- 165,764. OTTO SCHUETTE, of Paris, France, for "Photometers."—Application filed 16th June, 1875. *Brief*.—"Rotating disk of sections of varying degrees of transparency. Sections successively brought between the eye and a lens and the light to be tested. The power of a given light determined by the section through which its rays are powerful enough to pass, and just enable the marks thereon to be read."
- 165,774. PHILIP H. WHEELER, of Rockford, Ill., for "Watchmakers' boxes."—Application filed 31st October, 1874.
- 165,786. JOHN DANIEL BREZ, of Brooklyn, N.Y., for "Stem-winding watches." Application filed 23rd June, 1875. *Brief*.—"A coupling-piece, connecting the winding-arbor with the stem proper, permits removal of the movement from the case without disturbing the stem."

- 165,816. GAZZAM GANO, of Cincinnati, Ohio, for "Thermometers."—Application filed 28th November, 1874. *Brief*—"Illustrated cards are fixed to the back plates, said cards representing scenes indicative of various temperatures, corresponding with indications of the mercury at different parts of the scale."
- 165,933. ELEAZER KEMPSHALL, of New Britain, Conn., assignor to himself and William Nash, of the same place, for "Snap-hooks."—Application filed 7th July, 1875.
- 165,991. CHAS. FASOLDT, of Albany, N.Y., for "Tower-clocks."—Application filed 17th April, 1875. *Brief*—"In a tower-clock, the driving mechanism of the hands arranged separately from the clock-train, the connection of the parts being such that any irregularities in the movement of the hands, will not affect the operation of the train."
- 166,037. I. B. ABRAHAMS, of New York, N.Y., for "jewellery-pins."—Application filed 19th December, 1874.
- 166,220. CHAUNCEY C. PARKER, of Brooklyn, N.Y., for "Eyeglasses."—Application filed 8th July, 1875.
- 166,367. AUGUST HERMANN, and W. H. Taylor, of Stamford, Conn., for "Anodes for electroplating with nickel."—Application filed 26th June, 1875. *Brief*—"The particles of metal are compressed into the usual carbon anode while it is yet plastic. To a metallic anode the particles are attached by any adhesive substance."
- 166,433. EDWARD WESTON, of New York, N.Y., assignor to Stevens, Roberts, and Havell, of Newark, N.J., for "The manufacture of anodes for nickel-plating."—Application filed 10th July, 1875. *Claim*.—"A process for forming anodes for electro-plating, consisting of mixing particles of metal with a cement when in a plastic state, and then moulding, pressing and baking the mass to form a solid body of the required size and shape, substantially as herein set forth."
- 166,741. CHAS. R. BACON, and LEUTHOLD C. BROWN, of San Francisco, Cal., assignors to the Cornell Watch Company, of the same place, for "Safety centre-pinions for watches."—Application filed 19th June, 1875.
- 166,942. L. D. SIBLEY, of Vineland, N.J., for "Stereoscopes."—Application filed 17th March, 1875.
- 167,063. ANSEL S. BUCKLEW, of Colusa, Cal., for "Watch-case springs."—Application filed 20th June, 1874.—*Brief*—"A watch-case spring that may be readily fitted to different sizes of cases by filing the projections, said projections being made very thin and slight."
- 167,090. C. FONTAYNE, of New York, N.Y., for "Magic-lanterns."—Application filed 9th July, 1875.

LABELS REGISTERED.

312. THE DUEBER WATCH-CASE MANUFACTURING COMPANY, of Cincinnati, Ohio, title, "The Dueber Watch-Case M'fg Co."—Application filed 13th August, 1875.

RE-ISSUES.

6557. ANTONIO QUIROLO, of Hoboken, N.J., for "Stereoscopes."—Patent No. 156,311, dated 27th October, 1874.—Application filed 8th July, 1875.

DESIGNS PATENTED.

8557. WILLIAM F. MULLER, of New York, N.Y., for "Clock-cases."—Application filed 24th July, 1875.—Term of patent 7 years.

TRADE MARKS REGISTERED.

2799. JOSEPH GALL, of New York, N.Y., for "Spectacles and Eyeglasses."—Application filed 5th February, 1875. "A spread eagle, with the words 'J. Gall's' above it, and the words 'Achromatic spectacles and Eyeglasses' below it."
2820. HUGH MULLIGAN, of Philadelphia, Pa., for "Watches."—Application filed 24th July, 1875. "Words and figures 'General Andrew Jackson. Exhibition Watch, 1876. Philadelphia.'"
2830. Andrew L. Smith, of Geneva, N.Y., for "Spectacles and spectacle-frames."—Application filed 22nd December, 1874. "The letter 'C' and the words 'Crystal Spectacles,' arranged in an ornamental border."

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HOROLOGY.

(Continued.)

VI.—DIALLING.

IN our third article we somewhat anticipated what may, even now, very appropriately be repeated here in a briefer form. We spoke of the sun-dial of Ahaz as the first mention in any record of a mechanical time-keeper; and we also quoted several verses from 2 Kings xx. 9—11, as well as from Isaiah xxxviii. 8, to which the reader may turn and refresh his memory.

DIAL, as before stated, is derived from the Latin word *dies*, days; the ancients furthermore called the instrument by the name of *sciathericum*, from its measuring the time by a shadow. But there is a great diversity in dials, both of the sun and moon; and this diversity arises from the different positions of the planes, and the various figures of the surfaces upon which such planes are described. Some of the names explain themselves, and will be familiar to our readers, whilst others are not on such every-day familiarity. Thus, we have the *equinoctial*, the *horizontal*, *vertical*, *polar*, *direct*, *erect*, *declining*, *inclining*, *reclining*, *cylindrical*, &c. Dials are further classed as *primary*, and *secondary*.

A primary dial takes in the horizontal and the vertical; that is, when they are drawn on the plane of the horizon, or perpendicular to it, on the planes either of the meridian, or "prime vertical," when they are vertical dials. To the primary class may also be added such as are drawn on the polar and equinoctial planes, though neither horizontal nor vertical.

An equinoctial dial is, as its name implies, described on an equinoctial plane, or a plane representing that of the equinoctial. "A plane that is oblique to the horizon, either hangs over towards it, and makes an acute angle with the plane of the horizon, or it falls off backwards from it and makes an obtuse angle therewith." As this is rather over-scientific for the general reader, we will try and make it a little plainer, if we possibly can as we go on. The plane that falls back from the horizon is called a reclining plane. If it falls back equal to the complement of the latitude of the place where it is fixed, then it is said to be in the plane of the equinoctial, thus an instrument constructed upon these lines would be called an equinoctial dial. Again, equinoctial dials are divided into upper and lower; or, in other terms, zenith and nadir. Each division of the equinoctial dial has its separate functions, arising in this way. As the sun only illumines the upper surface of an equinoctial plane when he is on the northern side of the equator, or our half of the earth, an upper equinoctial dial can only show the hour during the spring and summer season. On the contrary, as the sun only shines on a lower equinoctial dial, while he is over the southern half of the earth, or on the other side of the equator, it follows from the same law, that a lower equinoctial dial can only shadow the hours in the autumn and winter months. In order, however, to combine the two forms so as to serve for all the year, from the first day of January to the last of December, an upper and lower equinoctial dial are joined together; that is, drawn on each side of the plane. Therefore, since the sun illumines one side or the other of an equinoctial dial the whole day, whatever may be the season of the year, such a united dial will show the hours of a day as long as the sun shines on it.

As we are not in this article writing for "learned persons," we think that we had better explain the meaning of the more difficult

scientific terms that have been given, in order that the unlearned reader may have some idea of what he has been and may be reading about. And here we may say, parenthetically, that nothing so annoys the ordinary reader—indeed, we may say disgusts him—more than having presented to him a mass of scientific verbiage without any explanation of what the unusually hard words mean. We hope that we have, hitherto, steered clear of that whirlpool, and that we shall continue to do so. We will illustrate what we mean by an anecdote, which was related to us as follows:—

“Having ‘shut up shop’ for the day, we strolled out, as is our wont, for our evening ‘constitutional,’ and, at the end of it, turned in with a friend to take our ease at an inn. We found what is known as a ‘parlour company,’ and an elderly gentleman, apparently one of the ‘lights’ of the place, holding forth in grand style upon, of all other subjects, what he was pleased to style ‘metaphysics.’ ‘He’ ‘spoke logic,’ ‘he did;’ and the transmigration of souls—for he went as far as that—became in his mouth the ‘transfiguration’ of souls! We could not help quietly smiling at the ‘raving’ of an otherwise apparently intelligent man, who was, certainly, old enough to have sense to know when to hold his tongue. Our smiling at him at once turned the torrent of his talk upon us, when he asked us if we ‘understood metaphysics?’ Well, our knowledge was exceedingly small in that direction. He thought so. He had often seen the smile of ignorance. Did we know anything about logic? Well, not much. But, said our friend, before he slaughtered us quite in such an intelligent company, perhaps he would be kind enough to tell us the meaning of the term, what it implied, and where did the word ‘metaphysics’ come from? That was a poser. Everybody was silent and fixed their gaze upon him. ‘He was a logician, he was, and knew what logic was, he should think;’ accompanying this with what was meant to be an uncommonly knowing toss of the head. We further asked him what logic was? and how the term ‘logic’ came to be applied? After a considerable amount of wrangling, our friend gave him a friendly caution to be careful and not hold forth among a class of very respectable persons about subjects, the meaning of the very names of which he did not know, and not to use many-syllabled words which he did not understand. During the conversation a gentleman, holding a prominent position in the parish, entered the room, and upon learning the state of affairs he nodded to our friend, whom he knew well, to leave for a minute or so. This was done, and in the interval there was much whispering between the newly-arrived one and the leading members of the company, the result of which was the hasty vanishing of the ‘logician.’ Our friend’s friend had let the cat out of the bag as to who and what that friend was, which the man of loud voice and big phrases finding to seriously disagree with him, put ‘about ship’ and vanished. We heard afterwards that his place in that assembly was not rosy; especially when he attempted ‘tall talk.’” We are now, of course, addressing ourselves to readers whose opportunities of book-learning may have been probably more limited than our own, and we here gladly offer to share with them what little we ourselves know. The above anecdote may serve to point the moral that, in talking or reading about any subject, it is of the first importance to a right understanding thereof, that we should have a correct knowledge—at least sufficiently correct for all practical purposes—of the terms used. Had the pretentiously “learned man” of that “parlour” company been able to have answered when questioned, that “transmigration” was formed of *trans* and *migro*, a removing from one place to another, without any reference whatever to “souls” (when we come to the Pythagorean doctrine we use the Pythagorean language, and say, “metempsychosis; thus *meta*, expressing change, or in, *psyche*, soul); and had he said that “logic” was from the Greek word *logos*, speech, discourse, and from deduction, the art of reasoning; had he known that “Metaphysics” was also a compound Greek word, *meta*, in this sense, “after,” and *physikos*—*physis*—“nature,” i.e. the first principles of thought, and their investigation, he would not only have saved himself a considerable amount of ridicule and annoyance on that particular evening, but also from the lowered estimation of his own friends and companions that followed. We have forbore in these illustrations to use the Greek letters, partly because they involve slightly different spelling, and partly that we are now specially addressing our present observations to the younger and less-informed readers of this journal. Of the literal truth of the anecdote we have not the slightest doubt, as one of the parties interested in it at the time is an old and respected friend of ours, and he assured us that it was but an index of what he frequently met with in places where better information ought to prevail. “We tell the tale as ‘twas told to us.”

It may be objected that what we have been saying partakes much of the character of the schoolmaster. That is exactly what we

intend it to do. Why has the long wail been continued about the threatened decadence of the English artisan from the want of technical education; and why is that artisan now clamouring to Parliament at his School board, and in his trade society, for technical education for his children? Because the publications bearing upon his particular trade that came within his reach either assumed that he was already acquainted with the technicalities of his own business, or were unable to furnish the proper information. The English workman has been at home and foreign international Exhibitions; he has seen, either by himself or his delegates, the value of foreign design; and hungering after that knowledge to apply it to his own solid handicraft, he calls out for technical education. Now, it is quite clear that the first step on the pathway of technical education is a knowledge of the meaning of the terms used, and why such terms came to be so applied; even this very word technical, how many men in a shop can tell that it is derived from the Greek *Tekne*, skill, cunning, contrivance; and that *Teknao*, and *Teknaomai*, mean to make by art, to execute ingeniously. These are the reasons which have induced us to stand a little on one side of our subject for the purpose of stating that in a journal of this character, addressing itself to the intelligence, formed and forming, of the affiliated representative trades, the meaning and application of terms belonging both to pure and practical science should be given when that science, or its art, is under survey. There may be some who differ from us; but, under the pressure of the inner consciousness that we are doing right, we shall persevere to the end.

(To be continued.)

VENEERED DIAMONDS.

THE enterprising capitalists who are pecuniarily interested in the Keely motor will doubtless be glad to learn of another great discovery, which promises results certainly as astounding as those due to the “watery vapour.” Abundant opportunities for investment are offered. The discoverer has worked twenty-eight years at the process, a little more than double Keely’s time; and unlike the latter colossal genius, he doesn’t keep the secret to himself, or lock it in the bosoms of a chosen few, but spreads it before an astonished world in this wise. Anybody can try it for himself, and have a small Golconda in an incredibly short period of time. We extract from gigantic advertisements in the daily journals, the “Process of Producing the Parisian Diamonds.”

“The body is of crystal, which is the hardest and best substance that could possibly be used for the purpose. Then, after the crystals are cut in proper shape, they are put into a galvanic battery, which coats them over with a liquid, that is made of diamonds which are too small to be cut, and the chippings and cuttings that are taken off of diamonds during the process of shaping them. Thus all of the small particles of diamonds that have heretofore been comparatively worthless, can now, since this great discovery, be used to produce diamond liquid.”—*Scientific American*.

CORAL.—The composition of coral has been carefully investigated by Professor Dana. Ordinary corals have a hardness a little above that of common limestone or marble, giving out a ringing sound when struck with a hammer. This may be owing, he considers, to the carbonate of lime being in the state of aragonite. It is a common mistake to suppose that coral, when first taken from its watery bed, is soft, and hardens through exposure. The live coral may feel somewhat slimy in the fingers, but if the animal matter be washed away it is found quite hard. Chemically the chief constituent of all is carbonate of lime, in the proportion of 95 to 98 parts in 100, with $\frac{1}{2}$ to 4 parts of organic matter, and some earthy ingredients, such as phosphate of lime with a trace of silica, amounting usually to less than 1 per cent. Forchhammer found 2.1 per cent. of magnesia in *Corallium rubrum*, and 6.36 in *Isis hippuris*. The source of these constituents are the sea water and the ordinary food of the polyps, the process of absorption, assimilation, and secretion going on in them as in all animal organisations.—*English Mechanic*.

INFORMATION has been received from the Astronomer Royal of the discovery of another planet by M. Paul Henry, of the Paris Observatory. The position and quality of the new planet, as described by M. Le Verrier, are as follow: “Right ascension two hours thirty-eight minutes; declension, north, fifteen twenty-five; twelfth magnitude; motion very slight in declination.”

At Příbram, in Bohemia, the Adalbert shaft of the silver and lead mines has reached the extraordinary depth of nearly 3300 feet.

THE
WATCHMAKER, JEWELLER, & SILVERSMITH,

A Monthly Trade Journal,

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W. W. W.



FINGER RINGS.

(Continued from page 102.)

THE ancient Assyrians, though remarkable for that love of jewellery which has ever been the characteristic of the Eastern nations, appear to have worn no finger-rings. Yet many of their bracelets are admirably designed for the purpose if produced on a limited scale; and they were worn by men as well as by women. Bonomi, in his "History of Nineveh and its Palaces" observes, "that not a single case occurs, amidst all this display of personal jewellery, of a finger-ring; the entire absence of this ornament in sculpture, wherein details of the nature are so elaborately and carefully attended to, leads to the conclusion that the finger-ring was an ornament then unknown."



FIG. 9.

Among the earliest traces of western civilization the finger-ring appears. Fig. 9 is an Etruscan ring of gold, now in the British Museum; upon the face are chimerae opposing each other. The style and treatment of this subject partake largely of the ancient character of Eastern art, and, like that, is very decisive and conventional.

The Greeks and Romans literally revelled in rings of all styles and sizes. Nothing can be more beautiful in design and exquisite in finish than Greek jewellery, and the custom of decorating their dead with the most valued of these ornaments has furnished modern museums



FIG. 10.

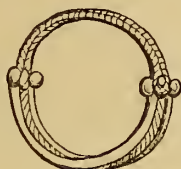


FIG. 11.

with an abundance of fine specimens. Figs. 10 and 11 are copied from originals found in the more modern Etruscan sepulchres, and are probably contemporary with the earliest days of the Roman empire. Fig. 10 is admirably adapted to the finger; being made of the purest gold, it is naturally slightly elastic; but the hoop is not perfected, each extremity ending in a broad leaf-shaped ornament, most delicately banded with threads of beaded and twisted wire, acting as a brace upon the finger. Fig. 11 is equally meritorious; the solid half-ring is completed by a small golden chain attached to it by a loop passing over studs; the links of this chain are perfectly flexible, and of extreme delicacy, they resemble the modern guard-chain, or to speak more properly, the modern chain imitates the ancient one; and we shall meet in the course of our researches with very many other instances of the oft-repeated fact, that "there is nothing new under the sun." This ring mania was not content with considering the ring as an ornament, or even as a talisman; a new science was revealed, the Dactyliomancia, so named from two Greek words, signifying ring and divination. The performance of its mysteries was in itself so simple, that it was deemed expedient to add certain formulæ, in order to make them more expressive. A ring was held, suspended by a fine thread, over a round table, on the edge of which were placed counters engraved with the letters of the alphabet. The thread was shaken until the ring, touching the letters, had united as many as formed an answer to a question previously put. This operation was preceded and accompanied by certain ceremonies. The ring was consecrated with divers mysterious forms. The person who held it was arrayed in linen only; a circle was shaved round his head, and in his hand he held a branch of vervain. Before commencing the gods were appeased by prayer.* This practice long prevailed, and is mentioned by Gibbon as having given rise to the persecutions for the crime of magic, in the reign of the Emperor Valens, at Antioch.

The simplest and most useful form of ring, and that, by consequence, adopted by the people of all early nations, was the plain elastic hoop, as shown in Fig. 12. Cheap in construction and convenient in wear, it may be safely said to have been generally patronized from the most ancient to the most modern times. Fig. 13 gives us the old form of a ring made in the shape of a coiled ser-

pent, equally ancient, equally far-spread in the old world, and which has had a very large sale among ourselves revived as a "decided



FIG. 12.



FIG. 13.

novelty." In fact it has been the most successful design our ring-makers have produced of late years. Yet this antique ring may add another "new idea" to the modern designer. It is made on the principle of some of our steel rings which we use to hold household keys, widening their circle by pressure. In this finger-ring the part in the mouth is inserted loose, so as to draw out and increase to the size of the circle needed.*

Though a great variety of form and detail was adopted by Greek and Roman goldsmiths for the rings they so largely manufactured, the most general and lasting resembled Fig. 14, a Roman ring, probably of the time of Hadrian, which is said to have been found in the Roman camp at Silchester, Berkshire. The gold of the ring is massive at the face, making a strong setting for the carnelian, which is engraved with the figure of a female bearing corn and fruit. By far the greater majority of Roman rings exhumed at home and abroad are of this fashion, which recommends itself by a dignified



FIG. 14.



FIG. 15.

simplicity, telling, by quantity and quality of metal and stone, its true value, without any obtrusive aid.

Sometimes a single ring was constructed to appear like a group of two or three upon the finger. Mr. Edwards has furnished the example (Fig. 15). It has the appearance of three rings united, widened in the front and tapering within the hand. Upon the wide part of each are two letters, the whole forming ZHCAIC, "Mayest thou live."

The Romans often preferred the Greek language in their most familiar customs.

Among the beautiful objects of antique art collected by B. Hertz, Esq., and sold by auction in 1859, by Messrs Sotheby and Wilkinson, were many antique rings inscribed with sentences and mottoes of a remarkable kind. Those bearing Greek inscriptions were the wordiest, such as—"I love not lest I go astray; but I observe well, and I laugh."—"They say what they will; let them say, I care not."

Many were evidently memorials of friendship; one represented a hand pulling the lobe of an ear with the word "Remember;" another, with a similar device, with the motto "Remind me of the noble character." Others were inscribed—EYTYXI—"Good luck to you," and "I bring luck to him who wears this ring." Among the Latin inscriptions were simple good wishes expressed in the words "Vivas" and "Bene;" or sentiments expressed in few words, such as—"Love me, I will love thee;" "Come, I will not;" "Be greeted, Fabiana." Many were simply inscribed with the names of



FIG. 16.



FIG. 17.

the persons to whom they were presented, such as, VLP.PRISCELLÆ ("Ulpia Priscilla"); others with the names of the owners, as Valeria Cleopatra, and Hermadion Caesaris. A massive silver ring inscribed with the name "Sabbina" is engraved (Fig. 16) from the original in the Londesborough collection. We place beside it (Fig. 17) a ring with a very different device, but one that cannot

* Barrera, "History of Gems and Jewels." "Decline and Fall of the Roman Empire," chap. XXV.

* "The History and Poetry of Finger-rings," by Charles Edwards.

fail to be looked on with singular interest. It is marked with the Labarum, the oldest sacred monogram of Christianity, which Constantine believed he saw in a vision, and placed upon his victorious standard and his coins with the motto—"In hoc signo vinces!" This ring came from the Roman sepulchre of an early Christian, and the hand for which it was originally fashioned may have aided in the conquering war of the first Christian emperor; or may have been convulsed in an agonizing death, "thrown to the beasts" of the circus, but reposing after death with the first martyrs to the faith.

Clement of Alexandria suggests to the Christians of his era, that they should have engraved devices of symbolic meaning allusive to

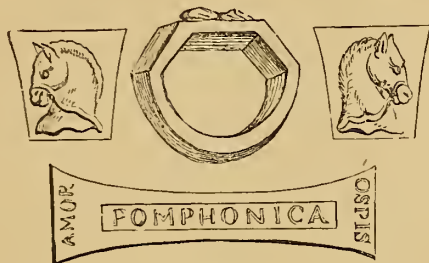


FIG 18.

their faith in place of the heathen deities and other subjects cut by Roman lapidaries; such as a dove, which symbolizes life eternal and the Holy Spirit; a palm-branch, peace; an anchor, hope; a ship in full sail, the Church; and others of similar import.

Gorius has preserved a representation of a gold ring (Fig. 18) which he believes to have been presented by a Roman lady to the victorious charioteer in the horse races; it is of peculiar form, but one that was a favourite with Roman wearers. The bust of the donor appears on the summit of the ring, and on each side are the heads of reined horses, as shown in our cut.

Her name is engraved on the lower part of the hoop, and on each side AMOROSPIS. The latter properly being HOSPEIS, having the aspirate omitted and an I for an E, induces Gorius to consider it a late work of the Roman era.

(To be continued.)

A MEASURING INSTRUMENT.—A very useful measuring instrument has been patented by Mr. E. Russell Morris, of the "Morris Patents Engineering Works," Birmingham. It is intended for general measuring purposes and entirely supersedes the measuring tape or rule, as it renders employment of two persons entirely unnecessary in taking measurements. It is simple and accurate, and appears to be coming into general use. A medal was awarded for it, at the Manchester Exhibition (Pomona), 1875. Messrs. Negretti & Zambra are the London vendors of the instrument.

LIGHT SOVEREIGNS.—The Bank of England elip every light sovereign that comes into the Bank. The weighing of every sovereign is accomplished quickly; they weigh 3000 in an hour with one machine. Mr. Palmer, the Deputy-Governor, informed the House of Commons Select Committee of last session on banks of issue that last year the Bank of England weighed coin to the amount of £23,100,000, and rejected £840,000, or about 3·6 per cent., as being light gold. For this last amount the Bank paid the value, making a deduction for the deficiency of weight, which is generally about 3d. or 4d. per light sovereign. It was stated to the committee that boxes of correctly-weighed gold, sent by the Bank of England to Scotland, frequently came back without having been opened, and Mr. Palmer stated that there is then some reduction for light weight. He explained this by adding that the mere shaking of the sovereigns on the journey will make a slight difference. There is a point at which every sovereign becomes light, and many sovereigns turn that point on the journey. Mr. Hodgson, M.P., a Bank director, stated that in a box of 5000 sovereigns the number which would be found to have turned the point would generally be about eight if they have not been disturbed; and he added, "You are aware that the sovereign which is in your pocket at 8 o'clock in the morning is not the same sovereign at 12 o'clock at night." After this rather alarming announcement it is satisfactory to find Mr. Hodgson stating also that the charge for light weight on the eight deficient sovereigns would be about 2d. per coin, making only 16d. on the box of £5000; so that, says he, "it really amounts to nothing."

THE GUIKWAR'S GEMS.

LEAVING the throne-room through a small door on the left hand side, we find ourselves on an extremely narrow veranda, which encircles a small square well which occupies the centre of the palace from top to bottom. Above we see similar verandas, and a number of natives looking over the railings. Beneath are a number of Arab and other soldiers keeping watch over several things, among them a sacred flag which is hung across the well on occasions of high festival. On the opposite side are a number of closed stanchioned windows, which guard the jewel-room, or jemdarkhana. Moving to the right there are rooms which look like dungeons, and are guarded by sentries. At the end of the veranda we enter a little close-smelling room, which would be dark were it not for the light of some wicks thrown in a salver of oil—a light which, we are told, is never allowed to be extinguished, so that it to some extent resembles the holy fire of the Parsees. Here, in a corner on the left, is a door—the outer entrance to the jewel-room. After some delay, an elderly Maharatta makes his appearance and opens the lock, and we enter a room which is as black as night and awfully stale smelling. One of the grated windows facing the well is thrown open, and by the little light thus obtained we perceive a number of shelves, which are loaded with State archives. Another ponderous black door being unbarred, we enter a dark room—the jewel-room. While a window is being opened, we prepare to be surprised with the flash of a thousand jewels, but are rather disappointed to find only a number of iron-clamped chests of drawers ranged round the room. But these drawers contain the State jewellery, worth 3,000,000 sterling, report says; and on the custodian pulling out one of the deep drawers in a central chest, and producing enormous morocco-covered cases, which are opened tenderly, we have no need to be longer disappointed, for a sight of a novel description meets our eyes. Here in one case lies displayed a breast-piece composed of chains of diamonds, numbering seventy-nine in all. All the diamonds are beautiful, but there are three in the pendant of ten which are conspicuously so, while one at least deserves to be called magnificent. This particular one occupies the centre of the pendant, and is, I believe, known as the Star of the South. It is nearly as large as a rupee, and its brilliance would, if you were inclined to be more poetical than covetous, remind you of nothing so much as a mass of Indian sunlight, gathered from the haunts the sun beats upon with greatest intensity, and compressed into the sparkling block before us. This diamond cost Khunderao 90,000L., and, like all great diamonds, has a history, though not such an interesting one, perhaps, as the Sancy diamond, which, you will remember, was found in the body of a servant of Baron de Sancy, who had been deputed to carry it as a present to the King of France, but, being attacked by robbers on the way, swallowed it in order to baffle their attempts to find it. According to Harry Emmanuel, one of our standard authorities on the history of great diamonds, the Star of the South was found in 1853 at Bogagem, in the Province of Minas Geraes by a negro. When rough it weighed 254½ carats, but since the cutting it weighs only 125 carats. It is of an oval form, and was cut by—and was, before it found its way to India and tempted the Guikwar, the property of—Mr. Coster, of Amsterdam. It is not perfectly white and pure; but nevertheless, it is reckoned one of the finest large diamonds in the world. The large oblong diamond fixed above the Star is flat, and possesses nothing like the purity and brilliancy of its great rival. It cost 300,000L. The whole breast-piece of diamonds cost over half a million sterling, and is one of the most beautiful necklaces of that description extant. When we have finished admiring the Star of the South and its seventy-eight multiradiant companions, we are shown a necklace composed of a number of chains of pearls, each of remarkable size and purity. This necklace is valued at 50,000L. I have been told that pearls do not retain their beauty for more than fifty years; and I could not help thinking it a pity that fate would not permit such a thing of beauty as this necklace to remain a joy for ever. Drawer after drawer is opened and case after case of jewels displayed, until the miserable dungeon seems to begin to look radiant. Rings, with stones in them large enough to stretch across three of your fingers; necklaces of diamonds, mostly flat and dull-looking, with pear-shaped emerald drops; nose-rings of pearls and emeralds; ear-rings of wheels of diamonds, and chains of gold; these and similar curiosities are displayed in succession before our delighted eyes until we are sated with sights, and leave the old Maharatta, who has watched the goings out and comings in of the jewels for twenty or thirty years, to put the cases back into the drawers, and bar and double-bar the doors and windows of the dungeons which compose the Jewelkhana.—Once a Week.

HOROLOGICAL TELEGRAPHY.

THE transmission of TIME by means of electricity has been so fully developed and so extensively applied, as to have established itself as one of the public scientific institutions of the country; and not of this country only, but of every nation of both hemispheres that lays any pretension or claim to belong to advancing civilization. The great and perfect Observatory of Greenwich, seated on the summit of the well-known upland from the valley of the Thames, has long been famed as the centre of the astronomical and horological world. When, therefore, the wondrous powers of that mysterious agency that takes no note of space, that unites ocean-divided continents, that makes Ariel's girdle a laggard in encircling the earth, that enables us to hold instant converse with ten thousand miles apart—when those powers had unfolded themselves they claimed and soon enchain the attention of the astronomer and the horologist. The recent death of Sir Charles Wheatstone is a fitting starting point for this subject. Let us only for a moment consider that it was no further back than the year 1837, that the deceased electrician, in conjunction with Mr. Cooke, took out the first patent for deflecting magnetic needles, and now see where the combination of electricity and magnetism ranks in the world's history. At the banquet given to Mr. Cyrus Field, a few years ago, Mr. Latimer Clark sent messages and received answers the same evening between London and Washington, New York, Cuba, Newfoundland, &c. As one marvellous instance a message was sent from Valentia, Ireland, to California, and an acknowledgment received in—two minutes! It seems almost incredible that any communication between places so many thousands of miles apart could be held in the short period of one hundred and twenty seconds!

HOROLOGICAL TELEGRAPHY, as a system, began in 1852, and those who want to know all the practical details of it at that time will find them in a very able and comprehensive lecture delivered by Mr. William Ellis, F.R.A.S., the then Superintendent of Time at the Greenwich Royal Observatory, before the Horological Institute, in 1865, and published in the Institute's journal. The Astronomer Royal was in the chair, and, as if to show "what great effects from trifling causes spring," he stated that, he "hardly knew how the Time signal came to be first proposed; it was somehow, partly in conversation, partly in other ways; how, it cannot exactly be said, but to Mr. C. F. Walker, Mr. Edwin Clark, Mr. Latimer Clark, and, afterwards, Mr. C. F. Varley, is the existence of the system mainly due."

The time is delivered every hour from the 60th-second beat of the normal clock of the Observatory. By a very beautiful contrivance this 60th beat transmits an instantaneous pulse, by the aid of relays, to whatever part of the kingdom it is in connexion with; this normal clock is the time-soul of the country. It is kept correct by means of calculations deduced from the workings of the transit instrument, the great equatorial, and the sidereal and solar clocks.

The stars which the transit instrument observes are called "clock stars;" because that on account of their enormous distance from the earth they are mere points of light in the telescope, whilst from the very same cause, their position, in relation to this planetary pea, the earth, has never been known to shift a single hair's breadth since they first dawned upon mankind! When we consider that the nearest star to us is 211,340 times as far off as the sun; and that light, which arrives here from the sun in $8\frac{1}{4}$ minutes, requires three years and four months to come from the nearest star; $6\frac{1}{2}$ years from the next nearest, and 21 years from Sirius, the brightest of all, where then must the "clock stars" be? Arago tells us that, in his deductions from Herschell's star-observation, some of the isolated stars are so distant that, taking light to travel from the sun in $8\frac{1}{4}$ minutes, the light of a star visible in a telescope of forty feet focal length would not reach the earth in a less period than 2700 years! To those who are fond of a neat little problem we will put it in this way. As 495 seconds (the time of light from the sun) is to 92 millions of miles (estimated sun's distance) how many millions of miles will 2700 years represent? From this it will be seen that the Observatory is not far wrong in taking the "clock stars" as fixed points from which to measure the diurnal revolution of the earth. The right ascension of one of these clock stars means the time that a correct sidereal clock should show when such star is on the meridian exactly. The chronograph of the transit instrument then records the time that such star passes each wire of the observing telescope; the mean of these is taken, and comparisons being made with the two small representative clocks already spoken of, some necessary computations are worked out,

when absolutely true time presents itself as the result. This is the time that governs the great normal clock of the Observatory, and by it is distributed far and wide throughout the length and breadth of the land. In this brief outline we have been obliged to pass over all the mechanical details which, with the necessary diagrams, are very interesting.

Little do the thousands of persons, who daily test their watches by the deflecting needle in the chronometer-maker's shop, or office, know the enormous amount of brain power and experiment that has been bestowed to obtain so apparently simple-looking a conclusion.

PRIVATE HOROLOGICAL WIRES.—Our next duty is to show in what way the time current is received at private stations, and what is done with it there. For this purpose we will visit an old-established high-class firm in the city, feeling sure that the trade will cheerfully endorse what we are about to say, when we tell our readers that for generations the house has stood in the very foremost rank.

Messrs. BARRAUD & LUND's, of 41, Cornhill, have, in addition to sustaining a high reputation as practical horologists, extensively employed the Greenwich time-signal system. Cultivated it, perhaps, (and we say this without the slightest desire to depreciate other justly-respected names in the art), more extensively than any chronometer-makers with whom we are acquainted. We will, therefore, take their method as our example, and use it for our present exposition.

HOW TIME IS MADE AT GREENWICH.—As this firm has a private wire from Greenwich, we must now go back to the Observatory normal clock. The correction of that clock, for error, after the true time has been ascertained in the way we have just stated, is as follows, and is the invention of the Astronomer Royal, having superseded an older method of his. "A permanent bar magnet is fixed in a vertical position on the pendulum of the normal clock, and a coil of wire, without an iron core, placed also in a vertical position immediately underneath the magnet, is fixed to the clock case. The coil occupies such a position that, when the pendulum hangs at rest, the end of the magnet is exactly over the centre of the coil. At every vibration of the pendulum the lower end of the magnet passes close over the upper end of the coil. The wires of the coil are led to a commutator placed in the computing room between the two small sidereal and mean solar clocks. By turning the handle of this commutator to one side, a battery current is placed in connexion with the coil; by turning it to the opposite side the direction of the battery current is reversed; in one case there is attraction between the adjacent ends of the magnet and coil, in the other case there is repulsion; when attraction exists, the pendulum being continually pulled towards the centre is accelerated; when repulsion exists, the pendulum being continually driven from the centre is retarded. When the handle of the commutator stands upright, the current is cut off from the coil and no effect is produced on the pendulum. To effect an acceleration or retardation of one second of time, a battery of such strength is at present employed as will produce that amount of change in about ten minutes. The simple coil of wire is used without iron core in order to get rid of the attraction which would exist between the iron and magnet when the apparatus is not in use, as such attraction might be variable. This manner of daily correcting the clock, by magnet and coil, has been in use since the year 1860."

We mention this method of correcting the clock, somewhat in detail, in order to show the value that belongs to Messrs. BARRAUD & LUND's time wires, which will be described further on. The normal clock, with which we have been dealing, is corrected to mean time every morning at 10 o'clock, except on Sunday, when the hour is a little before 1 p.m.; and as such correction hardly ever needs more than the fraction of a second, the character of the clock may be easily understood.

In order to send the time signals outwards, the normal clock has a contrivance set on the minute and seconds hands in such a way that no current can pass until those two hands coincide at the exact seconds beat of 60. At that instant the hour relay of wires is called into action and as instantly guns fire, balls drop, and needles deflect wherever the current reaches.

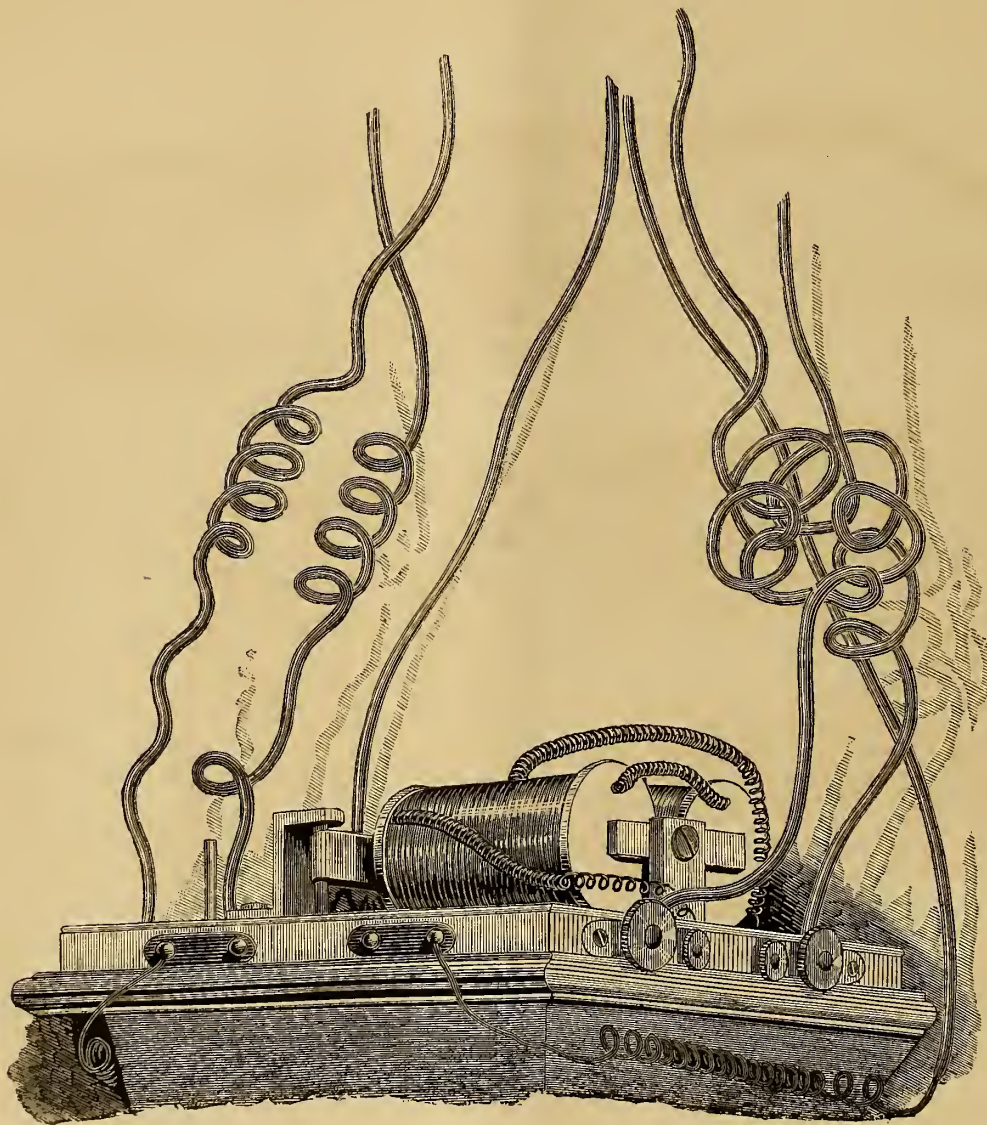
THE CHRONOMETER ROOM, at Cornhill.—Let us now enter Messrs. BARRAUD & LUND's chronometer room on the first floor of the house. We observe by the way that the walls are shelved from floor to ceiling, and every shelf is crowded with ships' chronometers undergoing the process of examination and rating; whilst on adjoining desks are large official-looking folios, in which the conduct and characters of these instruments are written.

Upon a bracket over the mantel-piece stands what is technically termed the "Relay." Our illustration shows the instrument with the necessary complement of ascending and descending wires; it is in

direct communication with the Greenwich normal clock, which has already been so fully explained.

The name of "relay" hardly sufficiently conveys the meaning of the functions of these instruments. They receive the main line wire, and by means of their electro-magnets, pass on the current to as many wires as may be attached to them. It is by means of these relays that telegraphic communication is carried on throughout the country. Furthermore, they re-strengthen the main line current; for, however exhausted that current may be, if it has only sufficient

balls, and deflects needles all over the kingdom. There is a powerful relay at London-bridge, and another at the Telegraph-street Station, Moorgate-street, of which more presently. For the distribution from the last-named place, Mr. C. F. Varley, the electrician, has invented what he calls a "Chronopher." This Chronopher is a clock controlled by the Greenwich clock, and feeds two relays which, with other arrangements, send currents east, west, north, and south. There is also at the London-bridge station what is named a "Switch Clock;" this clock is, like the Chronopher clock, under Greenwich



THE RELAY-DISTRIBUTOR.

life left to touch the relay that reviver imparts full power to all the wires belonging to it, each wire working in original force. For these reasons we have called it here the "relay-distributor," thinking that this name will be better understood. These relays play such an important part in electric telegraphy that we will mention one or two of them. The first is the hourly relay at the Observatory which is fed by the normal clock and distributes time signals anywhere and everywhere. The pull of its armature by the clock current creates new and independent currents, and fires guns, drops

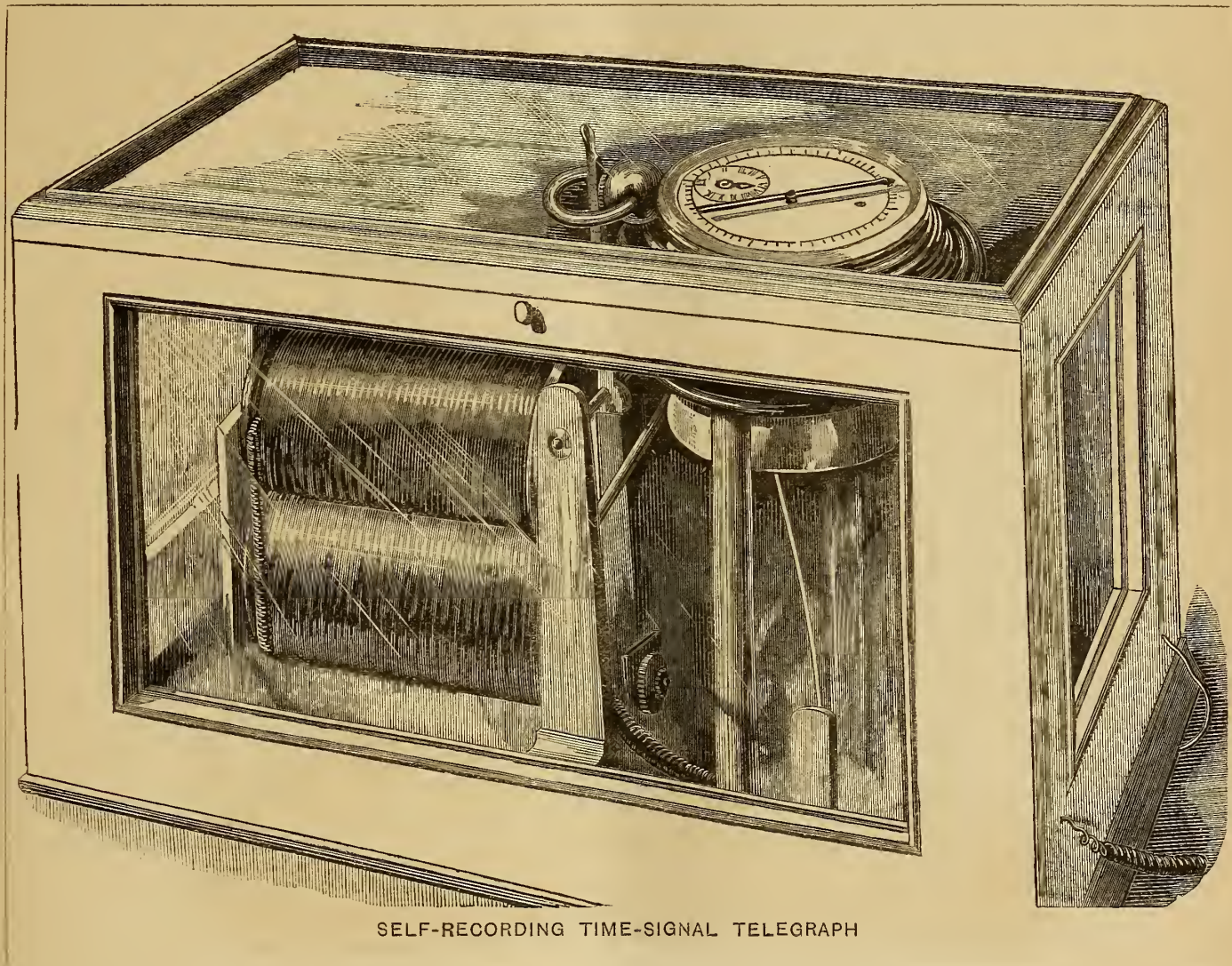
guidance, and is used for "switching" time from the Observatory pendulum to various places; in fact, these relays are asleep until the main line current arouses them to vigorous action. The wires that supply the time signals are termed "horological wires," and are used for no other purpose.

The relay-distributor at Messrs. BARRAUD & LUND's is a double one, and receives its current direct from the Greenwich Observatory clock as a single relay, after which that current is directed on to two sets of wires. The object of thus splitting it is to make sure of

efficiency in the event of either of the circuits getting out of order at any time. The signal is transmitted to one set of wires in the usual way, by drawing the keeper of the magnet against a fixed point; whilst on the other set of wires the circuit is completed by a small screw with an ivory point in the keeper pressing against an arched flat spring. This spring yields sufficiently to allow the previously mentioned wires to be closed up, and yet ensures its own business being efficiently done. This relay-distributor has never failed to transmit its split current for over three years, and, we may add, that its distinguishing specialty is the invention of Mr. LUND himself. We must not omit to mention that this room possesses an astronomical clock for the purpose of rating the chronometers.

We have spoken of the ascending and descending wires; we will follow one of these up to—

"The true seat of the time-keeping principle in every watch or chronometer resides in the union of a perfectly hardened and tempered balance-spring, and a perfect compensation balance, the weight and diameter of the balance being in just proportion to the motive force." Here "beating" is scrutinized, rim-screws turned in, and turned out, ovens and ice-boxes worked, compensations adjusted, and all the delicate and multifarious operations that produce the perfect timekeeper. The timing-room has also its "astronomical clock" and its "wire;" but here under these special conditions. The wire consists of a number of very fine threads formed into a kind of cord, having a galvanometer at the end. Being in this peculiar form it has all requisite pliability just as a hempen cord would have, and time is taken in this manner. The observer having placed himself in front of whatever instrument is undergoing the timing process, takes up a small wooden ruler in one



SELF-RECORDING TIME-SIGNAL TELEGRAPH

THE TIMING ROOM.—This room is under the special care of Mr. Bridgman, the general foreman, and is fitted up with every appliance for the purpose to which it is devoted. In this apartment, as in a school, all the timekeepers through the establishment have to take their finishing lessons under the tutelary discipline of the foreman. A very large population of watches, of one kind and another, must have felt his influence during the best part of a generation. Here along the windows, fronting, what watchmakers love so well, a northern aspect, is the bench, and at that bench what is known as the "timing" is performed. There main springs are "rodded," and their "pull" settled, balances poised and their springs examined, to ascertain if that wonderful compound of the correct eye, the well trained hand, the experienced judgment, and the knowledge of isochronism, that are the *sine qua non* of the high-class "springer" has done its duty. Ah, well might a late eminent horologist exclaim:—

hand, and the galvanometer attached to the magneto-electric wire cord in the other. One end of the ruler is rested on the clock case, and the other end in the ear. Fixing his eyes steadily on the galvanometer, whilst the ear follows the count of the beat of the clock by means of the ruler held against it, the instant that the tiny "click," speaks from the Greenwich normal clock, he makes his "equation" and reports true time to the tenth of a second! Now, as the tenth of a second is but the 600th part of a minute, and as 36,000 tenths go to make up an hour, let us hope that even the neglect of that fraction may never lose a man either a train, or a legacy.

But this same timing-room has an interest of its own, apart from anything that may have been imparted to it by horology. In No. 41, Cornhill, there once lived a respectable "money-scrivener," and citizen of London, named Gray, and to him, on the 26th of December, in the year of grace, 1716, was born a son, afterwards

named Thomas. This son was the only one of twelve children that survived the period of infancy—a most unusual and distressing mortality in one family. Most people have read a very feeling, sympathetic poem, commencing—

“The curfew tolls the knell of parting day,
The lowing herd winds slowly o’er the lea,
The plowman homeward plods his weary way,
And leaves the world to darkness and to me.”

Those are the opening lines of the *Elegy in a Country Churchyard*, and were written in that of Stoke-Pogis, Buckinghamshire, about twenty miles from London, the writer being Thomas Gray. He was laid in it himself, in August, 1771, in his 55th year; and that, too, without either “storied urn or animated bust,” until 1779, when Mr. Peun erected a monument to him. The room has not been altered in its structural form in any way.

The back bed-room, too, has a special interest attaching to it arising out of a singular incident or two. Some years ago the foreman wanted to drive a few nails into the wall beside the fire-place. On tapping it, however, with his hammer he found the sound quite hollow. This had never been suspected, and application to Mr. John Lund, the father of the two present members of the firm, produced an opening which brought a closet to light. On a shelf were found several parcels of papers, and amongst them the rent and poor-rate receipts of the house, dated 1670. The rent at that time was 48*l.* a year! Only fancy an entire house in Cornhill let at 48*l.* a year! The occupant of that floor at a later period seemed to sell hair-dye, for in another parcel was a letter from a customer praising its miraculous power, and enclosing five *l.* notes, and an order for a fresh supply, with directions that the change, 8*s.* 6*d.*, should be forwarded into the country with the dye. Singularly enough there was the packet containing the 8*s.* 6*d.* ready to send, but never sent. The silver had not escaped the “ravages of time;” it was quite black.

Those two rooms constitute the second floor of the house. On the floor above is a chronometer stock room, and the clock-makers’ room. As these call for no particular remark, we will leave the chronometers to their quietude, and the men to their work, and come downstairs.

THE SELF-RECORDING TIME-SIGNAL CHRONOGRAPH:—Passing to the office part of the establishment, we find a most ingenious application of “ways and means” to the intended purpose by the instrument whose illustration is given above. It is to secure a permanent record of the Greenwich time-signal, should no one be present at the important moment to receive it. This instrument consists of an electro-magnet (connected with one of the wires passing from the relay in the chronometer room previously mentioned), a bell, and an ordinary “dotting chronograph,” so named because its second hand is split, the end of the upper one dipping down through a tiny reservoir of ink in the point of the under one. This chronograph is placed on a stand (with a shallow well to keep it from shifting) in such manner that the tail of the magnet keeper passes through the bow and just touches the push-piece, which passes through the pendant. The signal is received in this way. Within ten minutes—to be exact—before the signal, the chronograph is set exactly coincident with the standard clock in the office, and being placed on its stand, awaits the arrival of the time current, which makes the keeper drive in the push-piece, ring the bell, and, co-instantaneously, the chronograph hand dots the dial, thereby leaving a visible record of the precise moment when the Greenwich pendulum completed the hour! This dot can be referred to at any time during the day. Mr. J. A. LUND has the merit of this valuable combination of what may be called an electro-magnetic self-recording time mechanism. The illustration is from a drawing that was made with the utmost care and minuteness, in order to convey as clearly as an illustration can, the useful and unique instrument here described.

THE ORTHO-CURRENT INSTRUMENT.—This instrument is a current insurer, and is fixed near its inventor, Mr. John Lund, in his private corner. Its mission is to sever true currents from false ones. It sometimes happens, during the prevalence of high winds, and, probably, other causes, that from the blowing together of the overhead wires, currents are sent where not intended. The wires are said to strike and rope by the force of the storm; and to produce great confusion on arriving at the wrong destinations. In order to keep clear of this Mr. Lund has invented what we call the “Ortho-current” instrument; it consists of the following arrangements. A small bracket clock breaks the circuit at two minutes past the hour, re-connecting only at two minutes before the hour, or four-sixtieths of the hour. This is effected by means of a brass wheel that is carried on a pinion once round in an hour. This wheel is cut down in its periphery, so as to leave the four-sixtieths as a

projection. The desired effect is produced by bending the end of one of the wires that rest on the periphery, so that when the “lump” comes round, it not only “makes contact” but also keeps that wire clean for continuous use. This instrument has only failed to make a right contact twice in about two years. Mr. Lund says that he finds it so exceedingly useful that he hardly knows what he should do without it. To look at it, it seems simple enough, and, like many valuable articles of ingenious simplicity, one feels surprised that it should perform its functions so regularly, and with so comparatively few interruptions to its action.

THE PUBLIC ASTRONOMICAL STANDARD CLOCK.

WE now come to the last, but not the least, interesting member of this widely-known timekeeping establishment; namely, the astronomical regulator at the entrance door; it is called the “Lobby Clock.” This clock has been familiar to more than one generation of “city men” long before horological telegraphy was known. We will now direct the reader’s attention to our very faithful illustration of it. Underneath the 60 of the minute circle, and just within the corresponding part of the seconds circle, will be observed another one still smaller, and somewhat sunk below the surface of the dial. It has a very small hand of peculiar shape fixed on its centre between two projecting studs. That small circle is the dial of the galvanometer, and that peculiarly-shaped hand is the “needle” of the same instrument; it is in connexion with the Greenwich clock in the same way that the other instruments are. This clock receives the Observatory mean time current at eleven a.m., which is the time shown by the illustration. The reader will, therefore, see that the hour-hand is at the 11, the minute hand at 60, and the seconds hand also at 60. Now, when the 60th beat of the Greenwich normal pendulum completes the hour, the needle in this dial deflects to the right. It is shown in the act of doing so, and, as the minute and seconds hands are exactly over the 60, the clock is right with Greenwich mean time. This, too, is Mr. Lund’s own arrangement, and it fulfils every expectation. The clock has a mercurial pendulum, but want of space prevents its being shown.

This clock has been long looked upon as the horological impersonation of the firm; indeed, some obstinate persons have been heard to declare that the clock is the only “Barraud & Lunds” in existence. In this, however, they are greatly mistaken, as they will speedily discover if they only venture within the folding doors. So extensively is this old favourite appreciated in the Cornhill part of the city, that from several enumerations which have been made, the persons who compare their watches with it average about 1000 a day.

TIME-TELEGRAPHING TO THE EAST.—So much for the local use: Messrs. Barraud & Lunds have made of Horological Telegraphy, but they have given it a still more extended use, a short account of which we will give if our readers follow us in thought to the Indo-European Telegraph Company’s offices, in Telegraph-street, Moorgate-street.

This office is in communication with all the chief stations which go to make the vast continent of Asia, and is sending and receiving messages to and from every hour of the day. It so happens that Captain Sartorius, brother of “Ashantee Sartorius,” is at Teheran, the capital of Persia, with whose Shah we are all familiar. Captain Sartorius has a “Barraud & Lunds” pocket half-chronometer, with their peculiar double-roller lever escapement. Now, Teheran is some 3700 miles from London, and it was required to be known in what relation the Captain’s watch stood to Greenwich mean time. Our time was eight o’clock in the evening, and at Teheran about eleven p.m. Major Smith, the Superintendent of Telegraphs was with Captain Sartorius at the Teheran instrument, whilst Mr. Black was in charge here. Mr. Lund was beside him with a marine chronometer set to the exact beat of the Royal Observatory normal clock, the properties of which we have already so fully explained. The first trial was interrupted at Berlin, but that having been rectified, and the line reported clear, in a few minutes the 3700 miles distant message began uncoiling itself at the London instrument.

Then came the words—“Give the signal-current at nineteen past eight, and keep it on till twenty.” Down went the instrument handle, Mr. Lund at the same time calling out the seconds from the chronometer, as they were to pass over the wire,—“fifty-eight, fifty-nine, sixty!” at which beat the signal-current “clicked,” and closed at Teheran, and at that instant both gentlemen would see that it was 8.20 p.m. by Greenwich Time. That was a feat in telegraphy; the seconds beat of a London chronometer making itself pulsate simultaneously in Persia! Several experiments were made during the evening; but the above will serve to explain the whole of them. Upon their conclusion a few personal inquiries were made from each instrument, and also about the going of the Captain’s watch, concluding with a “much obliged for the trouble you’ve

taken in London." "Very welcome." "Good night." "Good night."

Now, the most extraordinary thing in this—as in all other experiments—was, that in the return earth current from Teheran—it was so rapid that we have no expression to convey the infinitesimal portion of time occupied by it. The relay we have already indicated is a re-strengthening by fresh batteries, and magnets of the out-going wires, when the incoming current has acted upon them.

SPEED OF THE ELECTRIC CURRENT.

—It has often been attempted to measure the speed of the electric current. Again, another question naturally arises among those who are not conversant with the working of electric magnetism, and that is, How, with all these "relays" that we read of there is no loss of time; especially when it is considered how small a period a tenth of a second is? The return of the earth current in the experiment just noticed to the very place whence it started—having been to Persia and back—an entire distance of 7400 miles—was so instantaneous that no name can be applied to it that we could at all comprehend. Electricians have endeavoured to give a measure to the speed of the electric current, and the best thing that they have been able to do is to say that, at least, it travels at the rate of 200,000 miles a second; in other words that it goes a thousand miles in the 200th part of one second of time! Let any one look at the pendulum of Messrs. Barraud & Lund's standard clock as it makes one beat, and then ask themselves if they could possibly comprehend what the 200th part of that would be? Relays, when in working order, even if they encircled the orbit of the earth, would not have the slightest effect in retarding the electric current. It has been estimated that it would

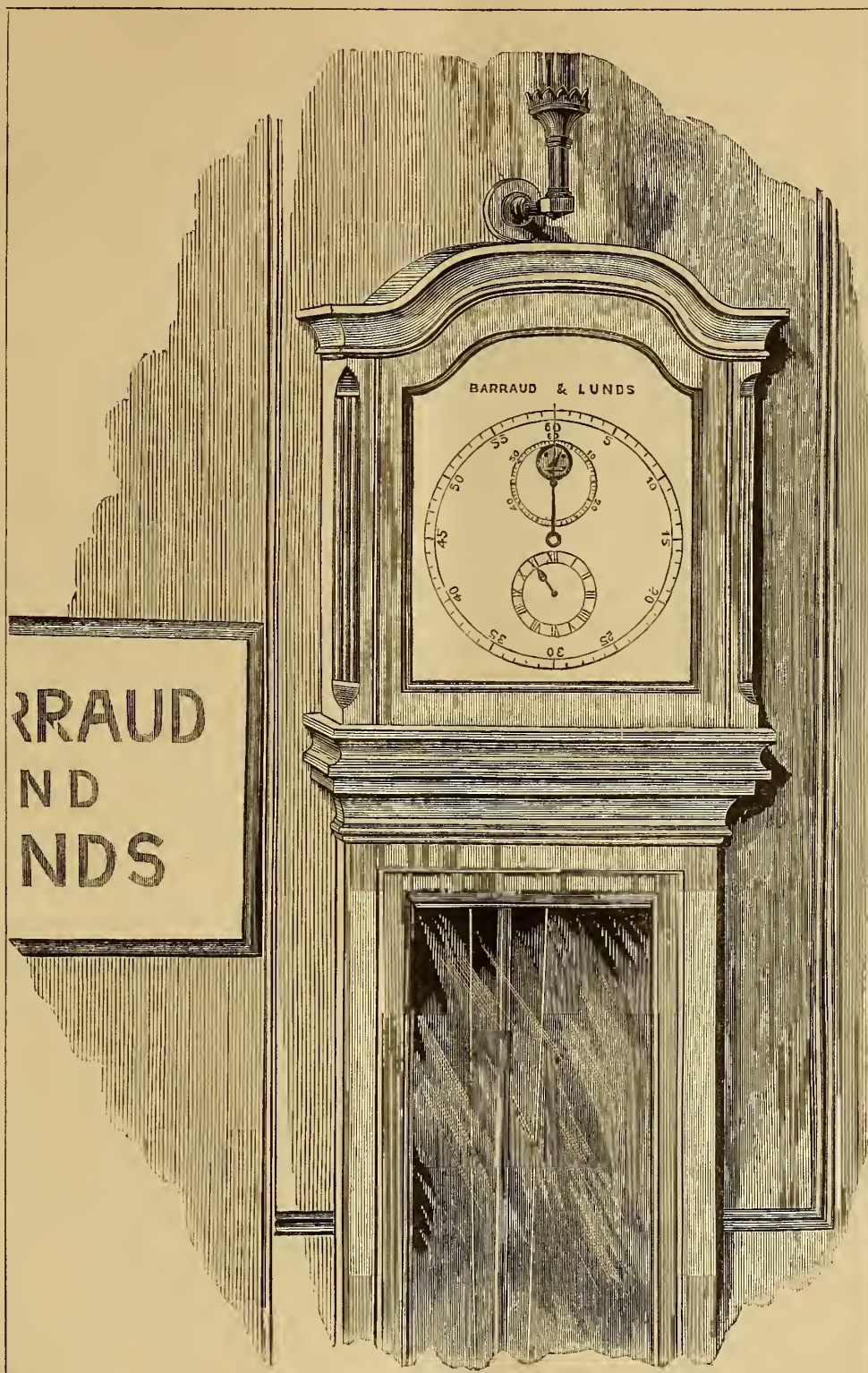
go eight times round the globe in less than one swing of that pendulum!

When the late Sir Charles Wheatstone was Professor of Natural Philosophy at King's College, about the year 1834, he was develop-

ing his discoveries, and making experiments on the speed of the electric current. One of these is very interesting. He placed the terminations of half a mile of wire so close to each as to see the entering and departing spark. He then had a steel mirror fixed on the seconds hand of a watch, and by winding it up, and triggering the chain he got 360 revolutions in a minute from it. Whilst it was running he discharged the sparks on the revolving dial. The object sought was this. If any time was occupied by the current in passing through the half mile of wire the entering and terminating sparks would be seen on different parts of the dial. This was not so; they were seen as one spark, thereby clearly proving that the current was less than the 360th part of a minute in running the half mile. This was the experiment which it is said determined him to devote himself to the work of using electricity for the purpose of distant communication; in other words, the development of the electric telegraph. The experiment was a beautiful one, and led to the grandest wonders which the world has ever known.

We have now said nearly all that we set down for ourselves on taking up our pen. We have kept as much as possible within due limits, considering the nature of the subject. If we have succeeded in awakening any latent interest in our readers we shall

have done some good. Perhaps many were not previously aware of the vast grasp which such a high department of practical science requires. It has been to us a labour, but "a labour of love," and as such we trust that it will be received.



THE PUBLIC ASTRONOMICAL STANDARD CLOCK.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 99.)

IN the South Kensington Museum is a gold watch-case, chased and embossed with a mythological subject. It has perforated arabesque work borders and raised medallions, containing emblems and figure-subjects. It is believed to be of French manufacture, about the year 1700. It was purchased for twelve guineas. In the same collection is a silver watch, the inner and outer cases of which are ornamented with openwork. The diameter of this article is two inches and a quarter; the maker's name is "Ackers, London;" the date is the early part of the eighteenth century; and it cost the nation £4.

In the *Tatler* for January 21st, 1709-10, appeared the following advertisement:—"A plain gold watch, made by Thompson, with a gold hook and chain, a cornelian seal set in gold, and Cupid sifting hearts, was dropped from a lady's side in or near Great Marlborough Street, on Thursday night last. Whoever took it up, if they will bring it to Mr. Plaistow's, at the 'Hand and Star,' between the two Temple Gates, in Fleet Street, shall receive five guineas reward. John Hammond." The house bearing the sign of the "Hand and Star," is of very ancient date; it bore that name in the time of Edward VI., Mary, and Elizabeth, when Richard Tottel published law books there. It then was, as it now is, numbered 7 in Fleet Street, and is in the occupation of Messrs. Butterworth, the legal publishers. In the number of the *Tatler* next following the one above named appeared this letter, dated January 23rd, 1709-10:—"Mr. Bickerstaff, I am bound in justice to acquaint you, that I put an advertisement in your last paper about a watch which was lost, and was brought to me on the very day your paper came out, by a footman; who told me that he would have brought it, if he had not read your discourse of that day against avarice; but that since he had read it, he scorned to take a reward for doing what in justice he ought to do. I am, sir, your most humble servant, John Hammond."

We read in the *Postman* for April 13th, 1710, as follows:—"Lost, in White Conduit Fields, or thereabouts, a silver pendulum watch, with a silver chain and a brass seal to it. Whoever brings it to Mr. Greator, at Busby's Folly, shall have a guinea reward."

In the *Tatler* for November 2nd, 1710, is an amusing paper, purporting to be an advertisement of certain articles which had been stolen from Lady Fardingle by her serving-woman. Among the many articles enumerated, as part of my lady's paraphernalia, is "a large new gold repeating-watch made by a Frenchman."

Steel, in the *Tatler* for December 16th, 1710, in reference to the prolixity of some talkers, says:—"For the utter extirpation of these orators and story-tellers, which I look upon as very great pests of society, I have invented a watch which divides the minute into twelve parts, after the same manner that the ordinary watches are divided into hours; and will endeavour to get a patent, which shall oblige every club or company to provide themselves with one of these watches, that shall lie upon the table, as an hour glass is often placed near the pulpit, to measure out the length of a discourse. I shall be willing to allow a man one round of my watch, that is, a whole minute, to speak in; but if he exceeds that time, it shall be lawful for any of the company to look upon the watch, or to call him down to order. Provided, however, that if any one can make it appear he is turned of threescore, he may take two, or if he pleases, three rounds of the watch, without giving offence. Provided also, that this rule be not construed to extend to the fair sex, who shall still be at liberty to talk by the ordinary watch that is now in use. I would likewise earnestly recommend this little automaton, which may be easily carried in the pocket without any incumbrance, to all such as are troubled with this infirmity of speech, that upon pulling out their watches, they may have frequent occasion to consider what they are doing, and by that means cut the thread of the story short, and hurry to a conclusion. I shall only add, that this watch, with a paper of directions how to use it, is sold at Charles Lillie's." Charles Lillie had a shop at the corner of Beaufort Buildings, in the Strand, where he sold snuff, perfumes, and such things, and took in letters for the *Tatler* and *Spectator* which were directed to him at the desire of Steele, who befriended him greatly.

At a meeting of the British Archaeological Association, held on April 27th, 1859, Mr. John Clutton exhibited a richly-chased silver watch-case of the time of Queen Anne. It was two inches in diameter; the upper ring being decorated with flowers and scrolls; the lower part having in its centre a nude figure of Pallas, the goddess of war, seated, and equipped with helmet, spear, and shield; in the distance was a tent. The surrounding border was divided into eight cartouches, two occupied with vases of flowers, and two with profile busts, one being a bearded male, the other a female. The

first might have been intended for a Druid, and the second for Queen Anne, for, although differing from her later portraits, it resembled some of her earlier medallions. At the same meeting, Mr. Alfred Thompson called attention to a watch-case of gilt metal, barely two inches in diameter, elegantly chased with flowers, scrolls, a seated female figure, and three standing warriors. This specimen was of the time of George II., and apparently the work of George Michael Moser.

In the South Kensington Museum is a gold-repeating watch, the inner case of which is richly chased and perforated, and bears the royal arms of England. The outer case is embossed with a hunting subject. The maker's name is "Z. Michau George Albrecht." The length of the article is two inches and a quarter, and the width one inch and seven-eighths. This watch is said to have formerly belonged to George I. It was purchased at the Bernal sale for £15. In the same museum is a circular watch in a rock-crystal, facet-cut case, of English make, about 1720. Its diameter is one inch and three-quarters; and it was purchased for £12.

Mr. H. De Mere has a watch-case of gold filigree, which belonged to the Chevalier de St. George, the "Old Pretender." It is of Italian make, and of the eighteenth century.

In 1721 appeared the following advertisement:—"Lost on Wednesday the 11 instant (as supposed between Leadenhall and Spittlefields Markets,) a small Gold Watch, made by Anthony Harrison in Birchin Lane, with a green spotted blood-Stone, hanging to a black Ribbon, set in Gold; and engrav'd, the Arms, a Lyon Rampant over three Bars; the Crest, a Tyger's Head with a Ducal Coronet. If offer'd to be sold, pawned, or valued, stop it, and give Notice to Mr. John Chadwell, Goldsmith, in Castle Alley, Birchin Lane, and you shall have Nine Guineas Reward and no Questions ask'd."

In Sir John Soane's Museum, Lincoln's Inn Fields, is a thick silver watch, which was formerly in the possession of Sir Christopher Wren, who died in 1723. The face of it is "with centric and eccentric scribbled o'er."

The horizontal escapement was invented in 1724 by Graham, an apprentice of the celebrated Tompion, and to whom we are indebted for two of the most valuable improvements in clocks ever made, namely, the dead beat or Graham's escapement, and the mercurial compensation pendulum. Graham's horizontal escapement is still extensively employed in the Swiss and Geneva watches; but in those of English manufacture it has been superseded by the duplex, and more recently by the lever, which is only the application of the dead beat escapement to a watch. The inventions of Graham and Harrison, together with the art of jewelling the pivot holes of watches, only practised in England, gave to English watches at the commencement of the last century such a pre-eminence that the wealthy of every other country sought to obtain them.

(To be continued.)

ANCIENT BROOCHES AND DRESS FASTENINGS.

(Continued from page 103.)

THESE enamelled brooches are frequently found in places where Roman towns once stood. They may, in fact, be said to abound in most museums. We select two, as examples, from the York Museum, a collection singularly rich in relics of Roman art. York was one of the most important stations in England, and here died the Emperor Septimus Severus, in the year 211, at the age of sixty-five, "worn out with anxiety, fatigue, and disease," says the Rev. C. Wellbeloved, the historian of York. He had returned from his successful war in the north, but had achieved victory with the loss of fifty thousand of his soldiers. Caracalla, his eldest son, was with him at the time, but immediately set out for Rome. In the year 304, when the empire was divided between the Cæsars Galerius, Maximianus, and Constantius Chlorus, Britain fell to the share of the latter, who immediately came over and fixed his residence in York. He died two years afterwards, and his son, Constantine the Great, by Helena, a British princess, succeeded him, being proclaimed emperor by the army at York, where he was at the time of his father's death. The first of these elegant brooches is of circular form (Fig. 2a), like a raised shield divided into several compartments. The side view placed with it will enable the reader to understand the arrangement of the pin, which moves freely on a pivot, the point held by a curve in the lower projecting bar. The second example (Fig. 2b) was found near Bootham bar, and is of more elaborate design. The raised centre is divided into ornamental compartments filled with rich purple and white enamel colours.

The point of the pin is here brought closer to the brooch, as if it had been intended to fasten a finer kind of material than the preceding one, which from its width would take in a coarser texture. The use of enamel colours as enrichments to metal ornaments belongs to the later days of Rome. Sometimes the

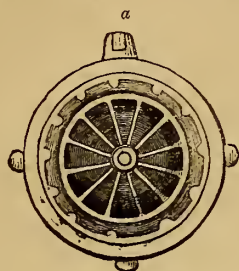


FIG. 2.



FIG. 2.

work is very coarse, but specimens occur (though rarely) of extremely delicate execution. It was executed in what the French antiquaries term the *champlevé* manner, that is, the part to be enamelled was cut, or hollowed, by a graving tool in the surface, and then filled with fusible colours, rubbed when cool to a level surface. This decoration was not confined to small articles of



FIG. 3.



FIG. 3.

jewellery, but was used for belts and sword handles. An admirable example of a small bronze vase thus beautifully enriched was found in excavating the triple tumuli popularly known as the Bartlow Hills, in Cambridgeshire. Horse trappings were highly enriched in the same manner. Boxes and small articles of furniture were also inlaid with enamelled *plaques* of metal. A tendency to great variety of design characterized the jewellery of the Byzantine empire; and the old circular fibula, that had been worn contentedly for so very many centuries, was discarded for new forms, which were again cast aside at the caprice of the wearer, attracted by the ever-varying designs of the jeweller. The bow, or harp-shaped fibula, retained its place when once introduced nearly as long as its circular forerunner. One of the finest specimens of a fibula of this kind is here given, copied from the original, which was discovered about twenty years ago by labourers employed on the railway near the town of Amiens, at a spot where other objects of the Gallo-Roman period were met with. The place may probably have been the cemetery of the town when the masters of the world ruled there. The workmen found a leaden coffin of great thickness which contained two skeletons, the smallest having within it many articles of female ornaments. These consisted of a pair of gold earrings of very peculiar and original design; a gold ring set with a carnelian, on which was engraved a youthful figure riding on a goat; a pair of slender armlets of gold; a pendent ornament of glass, evidently formed to wear as a charm to keep off the baneful effect of the evil eye, so much dreaded by the ancients; and this buckle



FIG. 4.

(Fig. 4). The latter is constructed of the finest gold, the bow decorated with an upright row of pellets, and three small flowerets

across the centre. The shaft is covered with most delicate chased ornament, or reeded patterns, soldered to the surface; a row of raised studs are each in the middle of a curved quatrefoil, the outer border raised in lines of indented decoration of that highly cultivated and artistic nation always excelling their Roman brethren, and the richer class in Rome patronizing them in preference. Nothing can exceed the delicacy and beauty of Greek jewellery, the Roman being of a heavier and less artistic taste. The character of the two nations may thus be clearly traced in so insignificant an article as a breast-pin. Figs. 5 and 6 represent two of the most ordinary forms of the bronze bow-shaped fibulae as worn by the ordinary classes. Fig. 5 was found at Strood, in Kent, in a



FIG. 5.

brick-field opposite Rochester Castle, on the other side of the Medway, which field had been the cemetery of the city when the Romans ruled it. The reader will notice in both the latter instances the pin is a continuation of a coil of strong metal, of which it is formed, and which gives it great strength and elasticity. When the latter was passed through the several folds of the dress, and the end secured in the strong metal catch below, it would not be easy to unfasten the garment or lose the pin. The second example is less stiff in contour, and from it the reader may more clearly com-

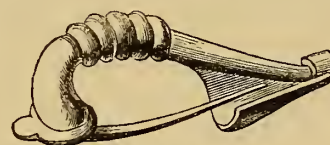


FIG. 6.

prehend the arrangements for securing the pin. Here, again, the pin proceeds from spirals at the upper part of the brooch. These common articles were sometimes made more attractive to the eye by decorating the upper portion with coarse enamel colours. A specimen is given in Fig. 7; it is of clumsy form and cheap construction; it was found, with many other minor antiquities, among heaps of bones in the well-known caves at King's Scarr, about two miles north-east of Settle, in Yorkshire—caves that are conjectured to have been the homes of the old Britons, who once lived a semi-savage life in them. In the excellent museum at Boulogne are preserved many articles found in the immediate neighbourhood, and belonging to the Gallo-Roman period. Among them is the bronze fibula, Fig. 8, which shows the very decided arc formed by the upper part and the mode by which the point of the pin was secured in the sheath below. Sometimes these bow-shaped fibulae were made with an extremely large and ugly bow, which hung over the dress. They are occasionally met with six inches in width, with a pin an inch or two longer, being used for the heavier winter cloaks. The gore-shaped pendant is made hollow, and is often decorated with incised lines



FIG. 7.



FIG. 8.

and zigzag patterns. They appear to have been in most favour among the Roman provincials in Gaul and Britain, particularly as the nature of the winters obliged them to seek in the heavy woollen *sagum*, or in the skin-mantle, some greater protection against the inclemency of the weather than their Southern conquerors required.

(To be continued.)

THE

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OUR ILLUSTRATED SUPPLEMENT.

IN presenting our readers with the accompanying illustrated supplement we have to acknowledge our indebtedness to the "Rambles of an Archæologist" for the designs, as well as for the complete information respecting the imaginative faculties of the designers, of the age to which our illustrations refer—viz., the close of the sixteenth and early part of the seventeenth centuries—which gives us an abundance of small engravings, comprising a vast variety of designs for all articles of ornament; and from them we have selected those in the accompanying supplement.

Fig. 1 "represents a cross of singular elaboration and beauty, now the property of Lady Londesborough. It is a work of the early part of the sixteenth century; the ground being of frosted gold, upon which is a foliated ornament in *cloissonné* enamel of various colours. It is also enriched with pearls and crystal; the lower part of this cross is furnished with a loop, from which a jewel of value might be suspended. Perhaps no article of personal ornament has exhibited a greater variety of design and decorative enrichment than the cross," and our readers will, therefore, be interested in some of the ancient patterns thereof.

Fig. 2 represents two designs of necklaces of widely different eras. "The upper one was possessed by a Roman lady, whose entire collection of jewellery was accidentally discovered at Lyons, in 1841, by some workmen who were excavating the southern side of the heights of Fourvieres, on the opposite side of the Seine. From an inscribed ring and some coins deposited in the jewel box, the lady appears to have lived in the time of the Emperor Severus, and to have been the wife of one of the wealthy traders, who then, as now, were enriched by the traffic of the Rhone. The necklace is of gold, set with pearls and emeralds; the cubical beads are cut in lapis lazuli, as are the pendants which hang from others. This love of pendent ornament was common to all antique necklaces, from the days of ancient Greece to the end of the sixteenth century. The second specimen is an illustration of this; it is copied from the portrait of a lady (bearing date 1503) and composed of a series of enamelled *plaques*, with jewels inserted, connected with each other by an ornament or chain."

Figs. 3 and 4 are "specimens of pendants of the seventeenth century, then so commonly worn by rich ladies. These were sometimes elaborately modelled with Scriptural and other scenes in their centre, chased in gold, enriched by enamel colours, and resplendent with jewels."

The famed "Grüne Gewölbe" at Dresden have many fine examples; in the Louvre are others, and some few of a good kind are to be seen in the Museum at South Kensington. The portraits of the age of Francis I. and our Queen Elizabeth frequently represent ladies in a superfluity of jewellery of a most elaborate character. The portrait of Mary, Queen of Scots, in our National Portrait Gallery, is loaded with chains, brooches, and pendants. This love of elaborate jewellery was a positive mania with many nobles in the olden time. James I. was childishly fond of such trinkets. His letters to his favourite, Buckingham, are often full of details of the jewels in which his majesty delighted.

BOOK NOTICES.

Grammar of Colouring. By ELLIS A. DAVIDSON, Esq. With illustrations. London: Lockwood & Co., Stationers' Hall Court, E.C.

THE object of the well-known author of this excellent work seems to be that of rendering the subject less abstruse and complicated than hitherto, to those seeking instruction in that branch of ornamental art, and in which aim he has been signally successful. The book is one that has long been needed, and will be found to contain considerable information practically useful to students, as well as to those more advanced in the art.

The work is divided into five parts, treating respectively of:—"Colours Generally," "Practical Colouring," "Oils and Varnishes," "Modes and Operations of Painting," and the "Characteristic Features of the various styles of ornament."

In every instance, the rules are laid down with careful precision and clearness, and illustrative drawings are most satisfactorily given wherever they are necessary or advisable. In a word, we cannot but heartily endorse the many high commendations already bestowed on the work and with the utmost confidence commend it to the perusal of our readers.

MESSRS. MACMILLAN & Co. will shortly publish, under the title of *The Modern Telescope*, a series of lectures delivered at the Royal Institution by Mr. J. W. LOCKYER, with notes and additions by Mr. G. M. SEABROKE.

OBITUARY.

IT is with deep regret that we have to record the death of Sir Charles Wheatstone, who died on the 20th ult., at the age of 73.

Sir Charles Wheatstone was a distinguished honorary member of the British Horological Institute, and took a deep interest in its welfare, as well as in the advancement of all matters connected with Horology.

Professor Wheatstone was one of the jurors of the Universal Exhibition at Paris in 1855 in the class for "heat, light and electricity," on which occasion he was appointed by the late Emperor a Knight of the Legion of Honour, on account of his "application of the electric telegraph." In 1872 he acted as one of the adjudicators in awarding the prize of the Horological Institute for the best essay on Isochronism. He was one of the jurors of the Exhibition of Work, held at the Institute in 1873; and last year again performed the duty of adjudication in connection with the essays on the subject of compensation. He was also chosen a correspondent of the French Imperial Institute of Sciences, and an honorary member of the principal academies of science in Europe.

TRADE PATTERNS BY PHOTOGRAPHY.

THE trade is indebted to Mr. J. W. King, of St. John's-square, for his happy idea of issuing photographic patterns of various descriptions and designs of articles of jewellery. Mr. King intends issuing a monthly series of such patterns of lockets, brooches, bracelets, &c., and, judging from the specimens before us, they are most admirable facsimiles of the original articles. The periodical issue of such patterns will be a very great convenience to the trade, especially to country purchasers, and will entirely obviate the delay and risk hitherto involved by sending articles backwards and forwards on approbation. Country jewellers especially will find them of great service when out soliciting: with these photographs in the pocket an order may frequently be secured which might otherwise be lost. In the shops they will also be of use, containing many patterns which would not be in stock at all times. The undertaking is one which will doubtless meet with the full support of the trade. Each design is copyrighted, and the price of the plates, being but sixpence each, must ensure a very large circulation. Speaking of the enterprise and manner in which the plates are produced, the *Photographic News* (an undeniable authority) says, "Mr. King's photographic patterns are admirably executed." Orders for the monthly series should be forwarded direct to Mr. King, or may be sent through the office of this journal.

THE following inscription is to be seen in the churchyard, Malaga, Spain:—"Here lies Juan Perrez, who was a good father, a good son, and a good husband. Note.—Do not mistake him for his younger brother, who bears the same name, and is now in penal servitude in Ceuta."

Supplement to the "Watchmaker, Jeweller, and Silversmith."

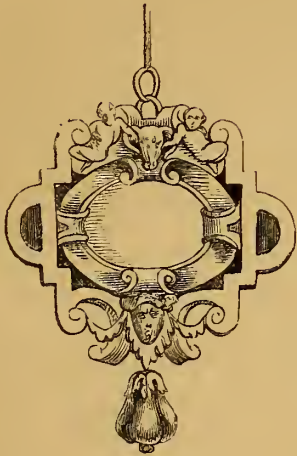


Fig. 3.



Fig. 1.



Fig. 4.

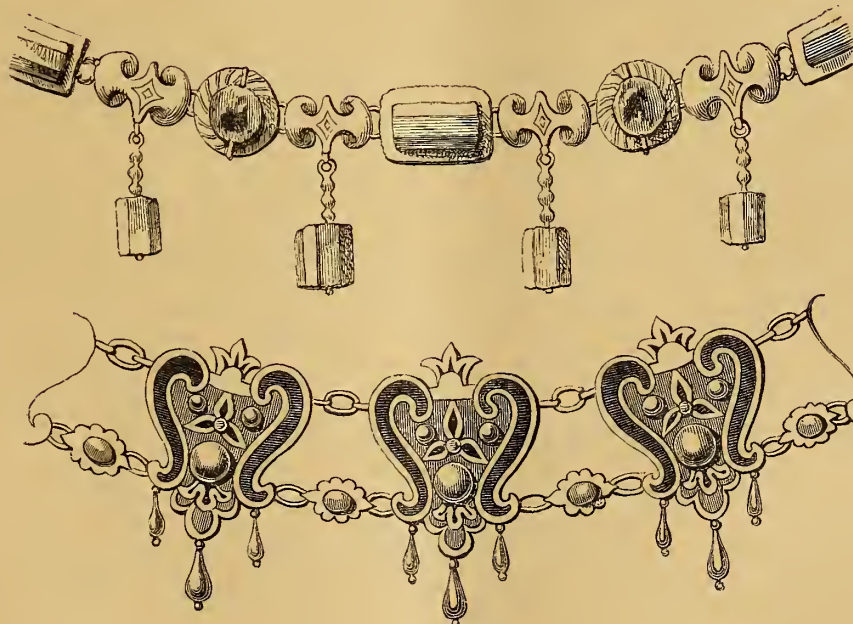


Fig. 2.

PRECIOUS STONES.

(Continued from page 100).

AQUAMARINA.

THIS stone is so named from its colour, which so much resembles sea-water.

Like other gems, it is divided into Oriental and Western.

Amongst those which, on account of their hardness, are called "Oriental," the most hard is merely a light-blue corundum with a slight tint of green and yellow. It is easily known by its specific gravity, which is always above four. This gem is very scarce, and it would have all the value of other corundums but for the colour, which is common to a great number of other stones possessing little value. The others are found in the island Ceylon, and from it they take their name. They are of a deeper greenish-blue colour, which renders them somewhat different from the Western stones. Their specific weight varies from 3.549 to 3.908, and it is thought that their hardness nearly equals that of the Brazilian chrysolite. They resist the wheel more than the others, and their brightness exceeds that of the Western gems. These are very transparent, and take a beautiful polish notwithstanding their inferior hardness, which is less than that of the topaz. The specific weight is from 2.70 to 2.77. They possess double refraction, but in a weak degree. The cleavage is brilliant and wavy, sometimes scaly. Their primitive form is an elongated hexagonal prism. They melt when exposed to fire and lose their colour. They are found in Daouria, in the Uralian mountains, in Siberia, in the Altai mountains, and in America. When analyzed they yield—

Siles	...	...	...	...	...	...	68
Alumina	...	...	...	...	...	...	15
Glucine	...	...	...	...	...	...	14
Lime	...	...	...	...	...	...	2
Iron	...	...	...	...	...	...	1

Those from Brazil are at present most prized because they are most beautiful.

The aquamarina of Saxony is a variety of quartz very little valued, and in that country it takes its name from the different stones whose colour it resembles; thus, the blueish is called aquamarina; the yellow, topaz; and the olive, chrysolite. Great crystallizations of Western aquamarinas are found. That which was exhibited in London in the year 1855 was very beautiful. Caire possessed one which weighed 540 carats.

Fine and beautiful aquamarinas are worth from four to five hundred lire* the ounce; those which are beautiful, but small, are valued at but twenty-five.

The ancients used the aquamarina in its natural state, and also engraved, and they tell us of several celebrated intagli on that stone. They knew it under the generic name of aquamarina, and perhaps they often confused it with the beryllus, of which Pliny says, "It has the same nature as the emerald, and is of a green colour."

AGATE.

So called from the Latin name, Achates (Ἀχάτης), of the Sicilian river now called Drillo, on whose shores this substance is found. This term generally indicates a great variety of semi-transparent quartzes. Agates are found in almost every part of the earth. Some are found in the East, some in the West, and the difference of their constituent parts makes the specific weight vary from 2.5891 to 2.6901.

The agate, properly so called, like that of Sicily, is naturally translucent; less transparent than crystalline quartz, but yet less opaque than jasper: it is too hard to be scratched even by rock-crystal; it takes a very good polish; it is never found in regular forms, but always either in nodules, in stalactites, or in irregular masses. Nevertheless, the agate called chalcedony frequently crystallizes in rhomboids. The Sicilian agate is often of a pale or grey colour, veined in a variety of forms; sometimes it is spread in reddish-violet spots. The "fasciata" agate is like a sample of many agates united in a single piece and disposed in bands close to each other, like ribbons or belts. The bands are sometimes in right lines; others are curved, and then of a circular form arranged round a common centre.

Eye agates consist of those parts of the stone in which the cutting discovers circular bands of very small diameter, arranged with regularity round one circular spot. These circles are frequently so perfect that they appear to be traced by the compass, and consist of two or three, seldom of a greater number. The

first round is white; the second, black, green, red, blue or yellow; the most rare are those whose circles are at equal distance from the centre.

The tree, or dendrifica, agate (from the Greek δένδρον, a tree) is that in which the material being formed in successive strata, it has allowed access between the strata to metallic solutions, which, under the pressure of the air and by the solidification of crystals, remain there in a metallic state after evaporation. It is called tree agate when the enclosed pieces represent trees, and muscosa when the pattern resembles flies: very seldom are these two phenomena represented together on one piece. Agates are found containing impressions of different plants, and of what appear groups of herbs, bushes of box-tree, and ramifications of various sorts. The tree agate of the East is superior to that of Europe; the beautiful polish which it takes, and its natural brightness, contrast in a marvellous manner with the dark-coloured ramifications. When the colour of the plants is red the agates are more valued, because more rare.

Figured agates are greatly admired for the form of their spots. Towards the close of the last century they were much in demand and brought a high price, whence they were eagerly sought for, and perhaps deservedly, on account of their singularity; for they were discovered with such combinations of design as would appear impossible without a hand and mind to have executed them purposely. In fact, the figures formed by metallic oxides inside the agate do not exist in a natural state exactly as they appear when the stone is cut. The skilful artist often finds it necessary to cut away some lines, marks, or spots which would otherwise deprive the design of regularity; whence it may be said that, in this respect, the lapidary resembles to a small extent the sculptor who carves the statue from the block, cutting away the superfluous parts. No little study and cleverness are requisite in deciding on the best treatment of the spots existing in the interior of the stone, and in executing the intagli so that they produce the best effect. Camello Leonardo da Pesaro states that he has seen a figured agate in which were distinctly represented seven trees on one even ground. Boëce de Boot declares that he possessed one in which a mitred bishop was designed; on another Roujet saw a Turk; Caire had one on which was delineated a cock in an attitude of defiance.

Crystallized agates are those whose mass is divided by numerous fissures into divisions, which are either square, triangular, or radiating. They are vitrified, translucent quartz.

The agate xyloidina, so called from the Greek word ξύλον, wood, is that kind generally designated agatized wood.

The Oriental agate is almost always transparent, and of a vitreous light; its material is homogeneous, and resists acids, being harder than the Western agates. Agates of all sorts have the property of acquiring stains of every colour by artificial means; black is given by boiling the stone in honey, in olive oil, or in water and sugar, and afterwards in sulphuric acid, which carbonizes the oil and sugar absorbed by the stone. To give a red colour, protosulphate of iron is added to the sulphuric acid, by which means the iron remains oxidized. The blueish colour is obtained by using yellow prussiate of potassium, together with protoxide of iron. The Oriental, as well as the Western agate, when much variegated, is used in works of art. We have beautiful fragments of cups, both smooth and carved, in this substance which bear comparison with the most classical remains of the art, wealth, and magnificence of antiquity.

(To be continued.)

NEVER TOO LATE TO LEARN.—It is a great mistake to suppose that but little can be accomplished after a man has reached the age of thirty or forty years. Nine-tenths of clever men have exhibited more vigour of intellect at fifty years than at any previous period in their lives.

Franklin was forty before he began in real earnest the study of natural philosophy.

Sir Henry Spelman only commenced the study of science when he was between fifty and sixty years of age.

Alfieri, whose writings wrought a revolution in the dramatic literature of Italy, was left without a father in his infancy, and only commenced to study in late years.

John Ogilby, the author of poetical translations of Virgil and Homer, commenced to study Latin when considerably above forty years of age.

Boccaccio, one of the most illustrious Italian writers, suffered nearly half his life to pass without improvement.

Handel was forty-eight years of age before he published any of his great works.

* A lira is about equal to 8 $\frac{1}{2}$ d.

PATENTS.

Notices to Proceed.

928. THOMAS WILLIAM GREAVES, of Birmingham, in the county of Warwick, has given notice in respect of the invention of "Improvements in solitaires."
2019. THOMAS GREAVES, of Birmingham, in the county of Warwick, Jeweller, has given notice in respect of the invention of "Improvements in the construction of solitaires and studs, applicable also to snap fastenings for boots, gloves, and other dress purposes."
2194. WILLIAM BROOKES, of 62, Chancery Lane, in the county of Middlesex, Patent and Registration Agent, has given notice in respect of the invention of "Improvements in watches, chronometers, and such time-keepers."—A communication to him from abroad by Frederic Fitt, of the city of Ottawa, in the county of Carleton, in the province of Ontario, in the dominion of Canada.
2242. JOSEPH NORMAN HARMER, of Whittlesea, and ALFRED STAFFORD WRIGHT, of Doddington, both in the county of Cambridge, have given notice in respect of the invention of "Improvements in the manufacture of watch-makers' peg-wood and other similar articles, and in tools or apparatus employed therein."
2335. AUGUSTE CONOD, of Lausanne, Switzerland, now of 8, Southampton Buildings, London, Watch and Clock Manufacturer, has given notice in respect of the invention of "Improvements in electric clock apparatus, parts of which are applicable to ordinary clocks."
2985. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, has given notice in respect of the invention of "Improvements in watches and similar timekeepers."—A communication to him from abroad by Albert Henry Potter, of Chicago, Illinois, United States of America, watch manufacturer.

Patents Sealed.

1865. WILLIAM MORGAN-BROWN, of the firm of Brandon & Morgan-Brown, Engineers and Patent Agents, of 38, Southampton Buildings, London, and 13, Rue Gaillon, Paris, for an invention of "Improvements in photometers."—A communication to him from abroad by Otto Shuette, Engineer, of 13, Rue Gaillon, Paris.—Dated 21st May, 1875.

Grants of Provisional Protection for Six Months.

2993. To ALBERT WILLIAMS, of Church Street, Kensington, in the county of Middlesex, for the invention of "Improvements in optical instruments to be employed either for amusement or for useful purposes."
3183. To JOSEPH PEARSON, of Birmingham, in the county of Warwick, Pattern Maker, for the invention of "Improvements in fastenings for solitaires, sleeve links, shirt and other studs, purses, bags, and other like articles."
3226. To LOUIS MARIE DETENRE, of the city of Paris, in the republic of France, Gentleman, for the invention of "Improvements in the manufacture of imitation steel ornaments and jewelry."
3227. To LOUIS MARIE DETENRE, of the city of Paris, in the republic of France, Gentleman, for the invention of "Improvements in the manufacture of imitation jewellery set with stones."
3238. To EPHRAIM SMITH, of Carlisle Street, Soho, in the county of Middlesex, for the invention of "An improved snap or fastener for bracelets, necklets, and other ornamental and useful articles."
3576. To ANTOINE JULIEN HYPOLITE DELCARTE, of St. Gilles, Brussels, in the kingdom of Belgium, Merchant, for the invention of "Improvements in telescopes."
3591. To CALEB LAWREN SHAW, of Birmingham, in the county of Warwick, Manufacturing Jeweller, for the invention of "An improvement or improvements in the construction of lockets."

Patents which have become Void.

- LETTERS PATENT for INVENTIONS which have become VOID by reason of the Non-payment of the additional Stamp Duty of 50*l.*, before the Expiration of the Third Year from the date of such Patents, pursuant to the Act of the 16 Vict., c. 5, sec. 2.
2870. BENJAMIN HAAS, Watch and Clock Maker, of 104, Boulevard Sebastopol, Paris, France, for an invention of "Improvements in watches, showing the date of the month, and days of the week."—Dated 30th September, 1872.
2970. BENJAMIN JOSEPH BARNARD MILLS, of the firm of Harris and Mills, of 35, Southampton Buildings, in the county of Middlesex, Patent Agents, for an invention of "Improvements in electro-magnetic clocks."—A communication to him from abroad by William Monroe Davis, of Cincinnati, Hamilton county, Ohio, United States of America.—Dated 9th October, 1872.
3129. WILLIAM HENRY GOSS, of Stoke-upon-Trent, in the county of Stafford, Manufacturer, for an invention of "Improvements in manufacturing articles of jewellery, dress ornaments, dress fastenings, and other materials."—Dated 23rd October, 1872.

Patents Granted in Foreign States.

FRANCE.

- 106,655. TEDESCHI, of Paris, for "A circular pendulum for clocks."—Dated 1st February, 1875.
- 106,809. LEVAYASSEUR and LAVERDURE, for "Improvements in jewelry articles, small bronze and fancy articles."—Dated 15th February, 1875.
- 106,834. DUTERNE, of Damery, for "Improvements in the manufacture of tower-clocks."—Dated 9th March, 1875.
- 106,868. GAY and MORGAN, of Paris, for "Using a substance called rosaline, obtained from the rosy parts of shells, in jewellery."—Dated 19th February, 1875.
- 106,907. LEHMANN, of Paris, for "A chemical product for facilitating jewelry work, &c."—Dated 23rd February, 1875.
- 166,789. VUILLEMIN, of Crangot, for "Improvements in clock-work."—Dated 1st March, 1875.

(Certificates of Addition.)

- 104,056. Mrs. REDIER, for "Watches."—Dated 3rd February, 1875.
- 105,402. LAUMEYER and FRANCHETTE, for "Improvements in the construction of mysterious clocks."—Dated 8th February, 1875.
- 105,630. LEPAIRE, for "Manufacturing eye-glasses and opera-glasses."—Dated 6th February, 1875.

PRUSSIA.

14. M. PETERSEN, of Altona, for "An escapement for chronometers."—3 years.—Dated 16th August, 1875.

BELGIUM.

- 37,934. J. CHALLENGER, for an imported invention of "Improvements in apparatus for illuminating clock-dials, &c."—Dated 27th September, 1875.—(French Patent, 24th September, 1875.)

UNITED STATES.

6610. JAMES H. BOYD, of Chicago, Ill., for "Furnaces for reducing ores of precious metals."—Patent No. 144,184, dated 4th November, 1873.—Application filed 8th January, 1875. *Brief.*—"Ore is pulverized, fed through hopper nearest the stack into the revolved desulphurizing-cylinder, passed through connecting-pipe into revolved roasting-cylinder, and on to the reducing-hearth. Hot air passes through the desulphurizing-chamber to oxygenize the agitated ore. Fluxes are introduced by the second funnel to the roasting-chamber. Slag runs continuously from the surface of metal in the reducing-chamber. Here metals are stirred in contact with lead. Bullion formed of lead and precious metals is withdrawn into the overflow-pot, which has a gate to regulate the height of metals in reducing-chamber. Iron, copper, &c. are raked off. Suction and condenser may be applied to air-outlet to save vaporized products. Products of combustion pass through reducing-chamber and through roasting-cylinder, and around the desulphurizing and oxygenating cylinder. Cold air enters at the rear and bottom of the furnace and passes forward to the grate."
- 166,990. AUGUSTINE JEWETT, of Lynn, Mass., for "Collets for balance-springs of watches."—Application filed 3rd February, 1875. *Brief.*—"A collet constructed as described, so that the inner end of the balance-spring may be attached as near as possible to the centre of the balance."
- 167,019. JAS. E. POTTER and ALFRED J. RICHARDSON, of Providence, R.I., for "Jewelers' screw-presses."—Application filed 28th April, 1875. *Brief.*—"The nut is made separate, so that it may be replaced when worn. The lower collar of the rest passes freely over the lower screw-thread."
- 167,063. ANSEL S. BUCKELEW, of Colusa, Cal., for "Watch-case springs."—Application filed 20th June, 1874. *Brief.*—"A watch-case spring that may be readily fitted to different sizes of cases by filing the projections, said projections being made very thin and slight."
- 167,089. FREDERIC FITT, of Ottawa, Canada, assignor of one-half of his right to Wm. Fingland and Benj. J. Draper, of the same place, for "Independent escapements for watches."—Application filed 2nd June, 1875. *Brief.*—"A removable plate, holding the escapement and regulating devices, is held in position by a single screw, which operates a stop device for stopping the movement of the remaining parts of the works when the escapement is removed."
- 167,174. C. HOPKINS, of Waltham, Mass., for "Watch-case tools."—Application filed 2nd January, 1875. *Brief.*—"The tool is provided with cutting and burnishing edges, for fitting watch-cases."
- 167,192. GRANVILLE M. NORWOOD, of Beverly, Mass., for "Solutions for cleaning gold, silver, &c."—Application filed 9th July, 1875. *Claim.*—"The herein-described solution for cleaning gold, silver, &c., formed of water, cyanide of potassium, ammonia-water, alcohol, oil of sassafras, or similar aromatic substance, and precipitated chalk, substantially in the proportions set forth."
- 167,327. JOS. GALL, of New York, N.Y., for "Thermometers."—Application filed 5th February, 1875. *Claim.*—"1, as a new article of manufacture, a transparent thermometer-case, perforated at its upper and lower ends, and closed at its upper end by a cap, within which is fitted a device wherein is received the upper end of an inclosed thermometer-scale, said scale being steadied and held in position thereby, substantially as described. 2, the combination of a transparent thermometer-case, perforated at its two ends, with a thermometer and scale, substantially as and for the purpose described."

- 167,372. MARSHAL WHEELER, of Big Rapids, Mich., for "Mainspring attachments for watches."—Application filed 8th July, 1875. *Brief*.—"An attachment for equalizing the force of the mainspring by drawing its outer end nearer the centre when the watch is wound up, and the force of the spring is greatest, and returning it toward the circumference as the spring is unwound and its power decreased."
- 167,407. RALPH S. MERSON, of Zanesville, Ohio, for "Watch-regulators."—Application filed 3rd July, 1873.
- 167,634. WILLIAM A. BELCHER and DAVID J. PLUME, of Ophir city, Utah, for "Hollow staffs for watches."—Application filed 26th June, 1875.
- 167,872. E. BOURQUIN, of La Heutte, Switzerland, for "Escapements for watches."—Application filed 24th July, 1875. *Brief*.—"An escape-wheel, formed with two rows of reversely-inclined teeth, acts upon a single pallet instead of the two commonly used."
- 167,963. WM. N. WEEDEN, of Waterbury, Conn., assignor to Benedict and Burnham Manufacturing Company, of the same place, for "Clock-cases."—Application filed 29th July, 1874.
- 168,065. JOHN J. THORNTON, of Cleveland, Ohio, assignor of one-half of his right to Dan H. Ridgway, of the same place, for "Compound balance-staffs for watches."—Application filed 18th May, 1875.
- 168,185. DAVID ROUSSEAU, of New York, N.Y., assignor, by mesne assignments, to Wm. F. Smith and S. Samuels, of the same place, for "Electric circuit-breaking clockwork."—Application filed 13th August, 1875. *Brief*.—"The circuit-breaking train of wheels acts only at the time when, in the course of the revolution of a pin-wheel in the time-keeping train, the pins have advanced sufficiently to allow the escape of an arm projecting from a spindle of the circuit-breaking train."
- TRADE MARKS REGISTERED.
2950. BROWN & Brothers, of Waterbury, Conn., for "Brass, German-silver, and silver-plated goods."—Application filed 24th July, 1875. "A human head and a star."
2979. SCHWOB, Brothers, & Co., of New York, N.Y., for "Watches."—Application filed 8th July, 1875. "Congress Watch, New York."
2980. LOUIS STRASBURGER & Co., of New York, N.Y., for "Watches."—Application filed 11th August, 1875.

CLOCK AND WATCH MAKERS' ASYLUM.

A VERY interesting ceremony in connection with the above institution, was enacted on the 23rd ulto., the day appointed to commemorate the completion of the building.

A large company of ladies as well as gentlemen, invited by the committee to witness the proceedings, assembled at the Railway Tavern, Colney Hatch, shortly after two o'clock, and proceeded to the asylum, where a space had been hastily roofed in close to the Memorial Houses. Here, after a short prayer had been offered, Mr. D. Clarke, the chairman of committee, called upon Mr. S. A. Brooks, as the originator of the proposal, to unveil the memorial stone of the "Workmen's Memorial House." After the ceremony had been concluded, the committee and visitors—in all about 90—sat down to lunch or dinner at the Railway Tavern, Mr. Clarke presiding. The toast of "The Asylum" was responded to by Mr. Thompson, who remarked that the watchmakers in 1814 established the first benevolent society in England; and watchmakers had also been the first to build an Asylum from the shilling subscriptions of its working members, an example he commended to other trades. The toast of "The Workmen's Memorial House Committee" was coupled with the name of Mr. Brooks, its chairman, through whose rare enthusiasm and indomitable perseverance the arduous task of obtaining the subscriptions was mainly accomplished. Mr. Brooks referred to the success of the undertaking; but declined to arrogate the whole of the praise to himself; and desired specially to share what honour there might be with Mr. Baxter, of the firm of Grimshaw and Baxter, Mr. Stevens, Mr. Ward, Mr. Birchall, and the Hon. Secs. of the Committee—Mr. Hartshorn and Mr. Spring. The health of Mr. Clarke, the chairman, was proposed in particularly eulogistic terms.—*Horological Journal*.

WATCH AND CLOCKMAKERS' PENSION SOCIETY.—The half-yearly general meeting of the subscribers to this society was held at the Shakespere's Head Tavern, Mr. Glasgow presiding. The chief business of interest was the election of a male annuitant. Out of three candidates, Martin Wilkes, watch finisher, was elected by a large majority. This excellent society is in a flourishing condition, and fully merits the support of the trade in general.

TRADE REPORT.—In Birmingham, the jewellery trade is showing indications of considerable improvement, chiefly in orders from the London market. The electro-plate trade is likewise busy.

In Sheffield, orders for plated goods are also coming to hand, and trade in that branch is improving.

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HOROLOGY.

(Continued.)

VII.—DIALLING.

IN our last month's article we opened the subject of sun-dials and in this one we propose to continue it. Having mentioned what an equinoctial dial would do, we will now go into further particulars, and show how to make one, and "work it."

Those who have practised dialling say that the equinoctial one is the "finest, easiest, and most natural of all dials," but, to make it fully effective, the necessity of drawing it double, as mentioned in our last, has a deterrent effect upon its use; still, as its construction explains the reasons for the other kinds, and as it enforces an excellent practice in drawing dials, we will here lay down the method.

And first of an upper equinoctial. Describe, from a centre C, a circle A B D E, and by two diameters, A D and B E, intersecting each other at right angles, divide it into quadrants A B, B D, D E, and E A. Subdivide each quadrant into six equal parts, by the right lines C₁, C₂, C₃, &c., which lines, as may have been surmised, will be hour lines. Through the centre C drive a "style," or pin, perpendicular to the plane A B D E. Having now marked off the dial, let it be raised so as to be in the plane of the equator, the line C₁₂ in the plane of the meridian, and the point A looking towards the south; the shadow of the style will show the hours both of the forenoon and the afternoon. To explain a little further. It will be evident, upon consulting the drawing which the reader will

have made, that the hour circles include so many arcs of the equator of fifteen degrees each, which, again, may be subdivided into four minutes for each degree. From this it follows that, the plane A B D E being supposed to be in the plane of the equator, the horary circle will also include arcs of fifteen degrees of the circle A B D E. Therefore, since the angles 12 C₁₁, 11 C₁₀, 10 C₉, &c., are each here supposed to be fifteen degrees, the lines C₁₂, C₁₁, C₁₀, C₉, &c., are intersections of the hour circles with the plane of the equinoctial. Furthermore, since the angle, or obliquity of the style, represents scientifically a line that is supposed to pass through the axis of the earth, its distance from the centre of the earth being inconsiderable, and it being the common diameter of these hour circles, the style's shadow will cover the hour-line C₁₂ when the sun is on the meridian, or the 12 o'clock circle; C₁₁, when in the circle at 11 o'clock; C₁₀, when in the circle of 10 o'clock, &c. This is the upper equinoctial dial, and some of our readers might find less profitable amusement during some of these long winter evenings than in constructing one.

To describe the construction of a lower equinoctial dial, the reader has merely to follow the above directions, with the exception that no hour line is to be drawn beyond that of six o'clock.

We will now proceed to state in what way a universal equinoctial dial is made, and as its construction is an index of the true scientific mind, apart from the importance of the thing itself, we bespeak attention to what follows.

Take a plane (or plate) of metal, ivory, or slate, and construct upon it an upper equinoctial dial, as already directed; and upon a plate of similar dimensions put a lower equinoctial dial. In the centre of the lower circle cut a small sunk basin, and in it place a magnetic needle. In the centre of the upper circle plate fix the

shadow pin, and from the corner of the lower one let a nicely graduated quadrant sweep up. Now, take these two plates, and join them at their edges so that, when the upper one is raised from the flat upon its hinges, the sun's shadow line shall cross both the upper and lower hour circles; at the same time let the loose end of the quadrant pass through a corresponding slit at the corner of the upper plate. By means of the compass-needle—if it is one adjusted in a case, so much the better—this compound dial may be so placed, that the 12 hour line shall be in the meridian of where the observer stands; again, by the aid of the quadrant, the whole construction may be so raised, that it will serve as a dial in any part of the world. This is known as the "Universal dial."

The next kind of dial is the horizontal, which, as will be surmised, is struck on a horizontal plane, that is, a plane parallel to the horizon. The principle of this dial is that, since the sun may illumine the horizontal plane whenever he shines, at all times throughout the year, when above the horizon, the hours can be shown in the same way. The horizontal dial is, perhaps, on this account more frequently made than any other; it is what we so often see erected upon a pillar, standing in the lawn in front of a gentleman's house. This is the method of constructing one.

Having laid down the plate, take and draw a meridional for the twelve o'clock hour line. From any point taken at random, erect a perpendicular, so that the angle from the upper point of the meridional shall be equal to the elevation of the north polar axis. From the extreme point of the perpendicular make another angle, also equal to the elevation of the pole, falling back upon the meridional line. Across the circle draw a right line, and from the centre through the divisions of the quadrant draw the hour lines and divisions, and when that is done enclose the work by a square, a circle, or an oval figure. Bear in mind that the style is always placed parallel to the earth's axis, and that the hour lines are the intersections with the plane of the dial of other planes, passing through the style inclined to one another at an angle of fifteen degrees, or one hour in time, successively.

In large dials where the extensive dimensions of the circle will admit of it, much greater accuracy can be obtained than in the ordinary way; but then the method is more scientific, and can only be carried out by those who are accustomed to intricate calculations. In those cases the geometrical lines are mostly set aside, and in their place the lines are determined by trigonometrical computation. This computation was very laborious until the year 1707, when M. CLAPIES, in the *Memoires de l'Academie Royale des Sciences*, gave to the world a new, easy, and comparatively expeditious method. For a horizontal dial, the elevation of the pole of the place being given, the question was to find the angles which the hour-lines make with the meridian in the centre of the dial. He laid it down as a canon that: as the whole sine is to the sine of the elevation of the pole of the place, so is the tangent of the sun's distance from the meridian for the hour required, to the tangent of the angle required. We have to express our regret that, on account of pressure both upon time and space, we are unable to furnish diagrams to illustrate the reasoning that governs all these arrangements; we will, however, try if we can demonstrate one or two of the leading constructions before we have done with the subject. We may here mention, by the way that, since the perfection to which clock mechanism has attained the necessity for the use of sun-dials has declined, still, the working out of the rules and the method of constructing are very instructive and interesting. Every intelligent mechanic has at least a window-sill. His first business is to ascertain how near the south his window faces. Assuming that to be all right, we cannot imagine a cheaper pleasure, either for himself and family than to work out the necessary lines, and make a sun dial. A bit of a school slate, a rule, a pair of compasses, a word or two about the meridian of the place and—there it is.

(To be continued.)

A SINGLE bitter word may disquiet an entire family for a whole day. One surly glance casts a gloom over a household; while a smile, like a gleam of sunshine, may light up the darkest and weariest hours. Like unexpected flowers which spring up along our path, full of freshness, fragrance, and beauty, so do kind words, and gentle acts, and sweet dispositions make glad the home where peace and blessings dwell. No matter how humble the abode, if it be thus garnished with grace, and sweetened with kindness and smiles, the heart will turn longingly toward it from all the tumults of the world; and a home, if it be ever so humble, will be the dearest spot beneath the circuit of the sun.

PRECIOUS STONES.

(Continued from page 133.)

THE AMETHYST.

THE amethyst, like all gems, is both Oriental and Western. The Oriental amethyst is a clear corundum of a violet colour, somewhat reddish, and of an elegant, velvet-like appearance, very bright, perhaps less hard than the ruby; specific gravity four, of weak double refraction, and it cuts deeply into the rock crystal. The Western amethyst can be distinguished from it by the fact that, when rubbed, it preserves vitreous electricity but twenty or thirty minutes, whereas the Oriental preserves it many hours.

The Western amethyst is a clear quartz, coloured violet by the oxide of manganese which it contains, of the specific gravity of 2.7; it crystallizes in the form of a hexagon, terminated at the heads by a species of cone with six facets. These crystals are often in masses, and the base is always less coloured than the top. The colour is more or less dark, and does not resist fire. This gem possesses double refraction, but in a moderate degree. It is motionless under the magnetic needle.

It may be remarked that amethysts are generally found in metaliferous mountains, and are always in combination with quartz and agate. This substance is found in Ceylon, Siberia, Kamtschatka, Arabia, Brazil, Prussia, Hungary, Spain, France, and Italy. The Carthaginian Spanish amethysts are of a very beautiful purple-violet colour, very similar to that of the Oriental, to which, however, they cannot compare in hardness. The Brazils supply some very valuable, which, when cut, are worth from 1000 to 3000 lire the kilogramme. There are immense lincs of them at one hundred leagues from Bahia, but the difficulty of extraction and of transport has rendered them useless hitherto.

Unpolished amethysts, in their ordinary condition, are very much prized, and it is easy to know what country they come from, because those from Siberia often have the points of the crystals mixed with chalcodony; those from the Brazils are fragments coming from considerable masses, partly fibrous and partly crystallized; those from Hungary are under the form of crystals joined together in a strange manner, whilst the largest are surrounded by many others much smaller; as to those from Mexico, they have the points of the crystals perfectly white.

There remains a great number of antique engraved amethysts, and Pliny gives as a reason for this that they are very easily cut (*sculpturis faciles*). The Western stones were preferred, but were generally of a pale colour and rather inferior quality, and King asserts that an engraving on a dark stone may be suspected of being modern. Scarabæi, both Egyptian and Etruscan, in amethyst, are rare. Roman intagli in this stone, however abundant, are seldom of good execution.

In all ages amethysts were used as feminine ornaments. With regard to their colour, Pliny says, "*Adricinium crystalli descendit albicante purpure defectu.*"

The Romans gave the name of amethyst to many different substances, beginning with violet corundum down to the purple garnet. Perhaps the name is of more ancient origin, therefore the vain Greeks interpreted it as from their language, because it was believed that he who drank from an amethyst cup was secure from the effects of any poison it might contain.

AMAZONITE.

This stone, easily mistaken for green jade on account of its colour, is nevertheless quite different, as it belongs to the felspars, of which it possesses all the properties. The amazonite is absolutely opaque; unlike the jade, it takes a very bright polish; its colour is a beautiful pear-green, and, fixing the eye on it, the longer it is looked at the brighter and more beautiful it appears. Its material is compact, no pores are visible in it; it is, however, covered with very minute marks in the form of little straws, which are of a lighter green. When it is grey-green, the marks are of a greenish-white; and when the ground is of a darker green the marks or points are very close to each other, and of a darker shade, although always to be clearly distinguished on the ground colour.

They are found in both East and West, in Siberia as well as in America.

There are veins of it on the Russian frontier of Mount Ouralaska; and the mineralogists of that country call it Krim-spath, that is,

green-spar; which name is more suited to the substance than that of "stone of the Amazons," or amazonite, as this name was not the result of scientific examination, but given because the stone was found at a short distance from the River Marañon, or Amazon, near the savage American tribe of Eupinambas.

It was known to the ancients, who procured it from the East; but we are not certain by what name they particularized it. Caire speaks of a beautiful antique vase made entirely of this stone, and which he saw in Florence.

This gem, which is easily engraved, can be used with fine effect in every sort of precious ornament.

AMBER.

Although amber is not a stone, all writers place it amongst gems, as well for its value as that it has been used ornamentally by almost every nation of the earth from the remotest period, and anterior to every historical record.

Feuchtwanger asserts that the Phœnicians sailed to the Baltic for the sole purpose of procuring amber there. I am of opinion, with Italian archæologists, that the Tyrrhenians, long before the Phœnicians, had explored those seas and drawn from the coasts incredible quantities of amber, with which they made ornaments of every kind and domestic utensils. This is proved by the vases, cups, spindles, and other articles of unknown use, collected by me from the necropoli of the very ancient Pelasgic cities of Italy.

The Tyrrhenians, and afterwards the Phœnicians, exchanged this substance with the Greeks, who named it *electrum*, ἤλεκτρον. Homer says that the Trojan women wore necklaces of amber.

It seems that the electrical phenomena which this material exhibits were observed by the ancients, since Talete, as a result of his observations, came to the conclusion that amber was animated. Philemon and Pliny thought it a fossil; and the latter person said, "heat resuscitates amber."

Tacitus, having observed that it often contains insects, believed that it was a vegetable juice, and from this it derives the Latin name of *succinum*, or sap. People used it as an amulet, and it was administered as a drug.

Even in our own day many naturalists have considered amber a mineral; but Sweigger and Brewster finally proved that it is a resinous gum; that is, the fossil juice of a now extinct tree of the primeval period, called the amber tree.

This substance is found in round nodules, which vary from the size of a grape stone to that of a man's head, and sometimes several of them are grouped together.

When broken, one surface appears concave and the other convex; it is translucent and transparent; has single refraction, and resinous light. It is found in different gradations of colour, from greenish-yellow to reddish-yellow. It oxidizes in the course of years and darkens into red, but its dust is always of a whitish-yellow. It scratches chalk, but is scratched by carbonate of lime.

This substance, under the action of the blow-pipe, burns with a yellow or blueish-green flame, emitting a dense smoke having a pleasing smell, and leaving a carbonized residue. Warm oil bends and makes it pliable, but it does not melt so soon as other gums, as it requires the heat of 517 degrees Fahrenheit. By distillation it produces an acid, which from its name is called *acido succinico*, and an essential oil named oil of amber, whilst in the retort there remains a brown deposit known as amber resin, which is used as a varnish. Insoluble in water, it dissolves in alcohol, as also in a solution of subcarbonate of potass. Its component parts are carbon, hydrogen, and oxygen, with lime, alumina, and silice; of a specific weight varying from 1.080 to 1.085; its power of refraction is from 1.365. Mixed with drying oil of linseed and essence of turpentine, it makes another excellent varnish.

Amber is found thrown from the sea on the shore. It is gathered in great abundance by the fishermen on the Prussian coasts after the autumnal tempests of the Baltic.

It is also found in China and America; in small quantities in Sicily; and in Catania a very singular kind, of a blueish colour. Even in France some is found.

In Prussia, however, there exist numerous caves of amber, which are explored by practised miners at a depth often of more than 100 feet. The amber of the mines differs from that of the waters only in being more brittle, and it is often covered with a thick crust of clay.

Those ambers which contain insects take the name of insectiferous amber. The yellow amber cut in the form of beads, either smooth or in facets, is much used, both in the East and West, as a feminine adornment. In the East it is called *Karabé*, and used to ornament pipes, pistols, guns, daggers, and yataghans.

(To be continued.)

THE WESTMINSTER CLOCK.

ON the 9th ult., the members of the Horological Institute to the number of nearly two hundred assembled in the great clock chamber, at Westminster, to hear a lecture delivered by Sir Edmund Beckett, the designer of the clock, upon its history, construction, and performance. The day was exceedingly dull, and the small modicum of daylight that found its way into the chamber simply made "darkness visible." As the lecture was a lengthy one, going a good deal into particulars, we find upon looking over our notes, that we can give no more than an abstract of it.

Sir Edmund, after alluding to the darkness of the day, plunged at once into his subject, assuming that many of his hearers had seen the picture of the clock in his book [*Clocks, Watches, and Bells*, which we reviewed some time ago.]

The necessity for making a clock of that enormous size arose from the unusual amount of work that it had to do. The dials are 22½ feet in diameter, and there are very few rooms in London upon the floor of which one of these dials would lie, its area being 400 feet. That is the largest one in the world with a minute. There is a dial at Mechlin 40 feet in diameter, but it has no minute-hand, which makes a vast difference in the work that the clock has to do. In the Westminster clock there were four dials, with minute-hands 11 feet long, besides three feet of counterpoises. These hands were exposed to wind and snow, but had only been stopped by snow once, when many miles of telegraph wire all over the kingdom had been broken down. He said that, although all the hands are counterpoised, still, the entire weight to be moved at every beat of the pendulum was not less than a ton and a half—(he meant all the moving part of the clock.) To effect this the fall of the weight is 170 feet, and the weight itself 1½ cwt. He next alluded to the method of deciding upon the escapement, and mentioned the remontoire that was put into the Royal Exchange clock in 1845, the first of its kind ever used in this country. After two or three years' performance, however, it was found to be knocking itself to pieces, and so old Mr. Dent tied up the remontoire with a piece of string. This produced a laugh; after which Sir Edmund went on to say that he invented a better escapement that was put into the great clock that kept time for the Exhibition of 1851. That clock is now at the Great Northern Railway station, King's-Cross, and is a minute-pause one, which the lecturer forgot to state. Next to the Westminster clock, it is accounted the best public clock in London. It does not strike, and the long hand, instead of moving at every beat of the pendulum, only jumps at the last beat of the minute. Considerable amusement is often caused by persons comparing their watches, and not seeing the minute hand move in the orthodox fashion, jerk the "chrono" into their pockets, and turn away in disgust.

Sir Edmund then referred to his likeness, to his book in connection with the three-legged escapement, the 'scape-wheel of which in the first escapement of the Westminster clock has only an inch in diameter, and a sixth of an ounce in weight, being driven by a watch-spring wound up every half-minute, so that that great pendulum was driven by a less weight than many a small church clock. He next gave a description of the double three-legged gravity escapement, the hanging arms, or pallets, and the easy way in which they are always lifted by the clock. He spoke of the opposition it met with at first, but said that now all the best public clocks in the country were made with it. From experiment he had found that the force required to keep the pendulum swinging properly was equal to rather less than an ounce falling an inch at every beat. The next point was the awkward way in which the clock had to be placed in the tower on account of the want of arrangement for it, and in passing he alluded to the oblique "leading off" rod, saving a deal of trouble and expense caused by the former plan of a straight one. Each pair of hands with their counterpoises and wheels weighed over 6 cwt., and the tube rods to them ran on friction-rollers. The quarter and hour striking was next spoken of, with a passing reference to an endless crab near the dial's wheel rest, for the purpose of raising or lowering anything into the clock room. The weights of the quarter bells are, respectively, 4 tons, 33, 26, and 21 cwt., and the problem of making them strike agreeably and evenly was what had to be solved. This brought up the question of "flies," and the common fault in large clocks to make them too short in the vane. There was no clock in the world lifting such hammers as those on the bells; no calculation could be made beforehand as to what size the flies should be. That room was 24 ft. by 18 ft., yet there was only just room to get them large enough. All the striking levers were lifted by cams instead of pins, the cams

being made of iron faced with steel, and screwed to a barrel bolted on to the great wheel. The rope barrel is cast-iron 3ft. long, and the rope is made of steel wire rather over half an inch thick; the other ropes are the same. The late Mr. Fulliamy had invented pins half an inch thick to strike that huge hour-bell; but had his plan for a clock been adopted, it would have broken itself to pieces with such an arrangement in less than a week. In order to equalize the striking of the quarters, two hammers were put to the fourth bell with two sets of cams for raising them. All the levers are 19 inches in length. So much for the quarters.

The hour-striking part had to lift a hammer capable of bringing out the full tone of a bell of $13\frac{1}{2}$ tons weight. The present bell is partially cracked, and, on that account, the hammer is only four cwt. instead of nearly eight cwt., as was originally intended. The "lift" is 13 inches at every blow. (Here the quarters chimed, and the clock struck. When the flies had finished their terrible noise, Sir Edmund said that to do such work as that was no joke; which any one hearing them could easily believe).

The lifting of such an hour hammer was no joke either, and to do it the lifting cams had to be made of the great thickness of $2\frac{1}{2}$ inches, with ten cams in the nine feet circumference of the wheel. He called our attention to the absence of jar by the striking, remarking that in most great clocks a jar existed such that, in the fall of a hammer like the one above, would have made itself felt during the striking, not only through the clock, but, also, the walls of the tower. There was no noise in the machinery when the clock struck the hour, whilst a great spring on the hammer tail acted as a buffer to the blow. Then followed some criticism of his critics, and he passed on to the winding arrangements.

The striking parts, both quarters and hours, take five hours each to wind, twice a week; but the going part goes the full eight days.

Steam-power, water-power, the tide, and even the tread of people walking over Westminster-bridge were one, and at first, all proposed by several ingenious people, the mention of the last named method raising hearty laughter. However, it was finally decided to wind the clock by hand, and by hand it is wound. A provision for the hours and quarters striking during winding is made, by a lever dropping in front of the winding handle, just a minute before the striking time, when the winder pulls the winding gear out of action, with the greatest ease, and resumes when the striking is over.

With respect to the general rate of going of the clock, which is published in the Report to the Visitors of the Royal Observatory yearly, the following is the rate:—It was under one second of error for 83 percent. of the days of the year, and only two seconds on 3 per cent. of the days, or about ten days in the whole year; which uniformity has been maintained for several years. He then referred to a statement that in consequence of dark nights, no star observations could be taken at Greenwich for ten days, when the astronomical clocks were a second and a half wrong; thereby, showing that the Westminster clock could compare favourably, even with them.

The clock reports itself to Greenwich twice a day, when the true time is sent back by "wire," and then the men attending, can easily correct any error. The compensation is by means of zinc tubes at the bottom of the pendulum. This pendulum is a two second one, being 13 feet long, i.e. to "the centre of oscillation," but 15 feet in all, and weighs nearly 700 lbs. It is carried by a 3-inch wide spring, $\frac{1}{16}$ thick. Each of the two three-legged escape-wheels is 6 ins. long, and the fly-vanes are 12 inch by 2 inch. The clock frame is 16 feet long, 5 feet 6 inches wide, and partly on the top of the shaft walls, and partly on east-iron plates bedded on the walls, and going right through a back wall as well.

The hands are set for large alterations, through the hour-wheel, as in other large clocks, whilst to retard or advance it is merely an operation of lifting the pallets, or holding the escape wheel so many beats. It can be sent on a second a day, by putting an ounce weight, or the 16,000th part of the weight of the pendulum, on the collar at the middle of the rod; sperm is the oil that is used. The clock cost 4080*l.*, the architect's dials 5334*l.*, the balls 6000*l.*, but their frames, which were designed by Sir Charles Barry, the same architect of the tower, cost 6600*l.*

These are the material points of the lecture, upon the conclusion of which Mr. Jackson, one of the Vice-presidents of the Horological Institute, carried the unanimous vote of thanks of those present, to Sir Edmund Beckett. In his reply he animadverted severely upon the people of London being so far behind the great towns of the kingdom in reliable public clock accommodation, and the proceedings then terminated.

A NEW JERSEY tobacconist, with commendable frankness, advertises, "I shall continue to keep on hand imported cigars of my own manufacture."

ROYAL ASTRONOMICAL SOCIETY.

THE first meeting after the long vacation was held at the Society's Rooms, Burlington House, on the 12th ult., Professor Adams (President) in the chair; Secretaries, Mr. Dunkin and Mr. Ranyard.

The President observed that amongst the gifts which had been presented to the Society since their last meeting in June was a very important series of solar photographs, taken by the late Canon Selwyn at Ely. They represented a complete sun-spot period of eleven years. Knowing the interest which the Society would take in these solar autographs (as he used happily to call them), the Canon had intended to present them before his death.

Professor Adams called upon the Astronomer Royal to make a communication to the Society, and so doing he took occasion to express his hearty congratulations, as well as those of the Society, to the new Freeman of the City of London.

Mr. De La Rue desired that ocular demonstration of the honour that had been conferred on the Astronomer Royal by the City might be given to the Society. The casket was then brought into the room and placed upon the table.

The Astronomer Royal, who was received with much cheering, said that after the recess he thought it would not be improper to state the general course of work which had been going forward at the Royal Observatory since they last met. In the first place they were commencing to prepare a new star catalogue, including the results of observations for eight years; and in connection with star observations he would mention that Mr. Christie, in paying close attention to these observations, had come to the conclusion that something had gone wrong with the micrometer screws of the transit circle. On examination it was found that these screws, which must have been used at least a hundred thousand times, were beginning to get worn. Happily they had other microscopes to which they could refer for the purpose of examining the graduation of the circle, and this defect would soon be remedied, and a correction allowed for past errors. Beyond the ordinary course of observatory work, Mr. Christie was engaged in a series of observations of the satellites of Saturn. These observations had been made possible, and indeed had been suggested, by the ephemerides which Mr. Marth had published in the transactions of the Society. And he wished to impress upon every one, who thought that he had made out a law, that the step to take was to be observed, and they, the old class of astronomers at the Observatory, would undertake the task of following it out. Suggestions had been made as to the probability of the recurrence of physical changes upon the planet Jupiter. They had been endeavouring also to note these changes, but it appeared to him that what especially wanted doing was to note the spots and clouds on some particular part of the planet's surface; and, as we know the rotation period of Jupiter pretty well, we might compare the appearances on the same part of Jupiter as it reappeared from revolution to revolution. The next thing to remark upon was the progress being made at the Royal Observatory in solar photography. They had now for more than a year taken photographs with considerable regularity, and in one respect it had been a very thankless task, for there were fewer spots on the sun now than he could ever remember. The next subject that had engaged their attention was stellar spectroscopy. In this they had been following in the footsteps of Mr. Huggins, who had pointed out to them what might be learnt as to the approach or receding of stars from or towards us in the line of sight. As to this a goodly number of observations had been collected, and a paper had been written upon the subject by Mr. Christie, which would, no doubt, be published in the "Notices." He was bound to say that at first the observations had not agreed very well, but latterly they had grown more consistent. The difficulties that had to be encountered could not be conceived by any one unacquainted with the spectroscopy and all its subordinate parts. One of the chief obstacles to be overcome seemed to be the difficulty of getting plane surfaces to the prisms. On the whole, he might say that the results of the observations agreed in the main with those of Mr. Huggins. It had been his (Mr. Huggins's) privilege to start a science, and it was theirs to revise it. (Applause.) They intended to follow up this matter, and in time they hoped to produce results which would do honour to Mr. Huggins's invention. He would warn, however, any one who wished to work, either in this direction or upon the protuberances of the sun, that they would have to face plenty of expense and trouble. They were also busily at work at the Observatory on the reduction of the observations on the transit of Venus. This was a heavy work, and one that would last a long while. It was not so much the reduction of the observations of the transit itself, as of the observations immediately connected with it, such as the correction

of the instruments; when this was accomplished the rest would be easy. The Society would be aware that, in a paper which he presented to them many years ago, he had pointed out that he would prefer observations of the opposition of Mars in 1877, to observations of the transit of Venus, for the purpose of determining the Sun's distance. It would be in the power of almost any observer provided with a good equatorial, and more especially of those who happened to be situated near the equator, to determine the parallax of the sun, probably, better than it could be determined in any other way. To aid in endeavouring to carry this out, they had prepared at the Observatory, a chart of the path of Mars amongst the stars during its opposition in 1877, and he trusted that the Society would allow this to be published in their monthly notices. (Applause.)

Mr. De La Rue then gave an account of the preparations that were making at Paris and Vienna for the promotion of physical astronomy. He said that at Paris a large reflecting telescope, only half an inch less in diameter than that at Melbourne, was just completed. It would be mounted within a house that could be wheeled away. Besides this large instrument, M. Leverrier intended to take photographic observations with an instrument of large aperture. He had also been much struck with what had been done at Vienna. The old observatory was in the middle of the city, but Dr. Littrow had succeeded in getting the Austrian Government to found an observatory really worthy of the empire. It was to be outside the city, and was to stand upon an area of some fifteen or seventeen acres. There was to be a central dome of forty-five feet in diameter which would hold a refractor of twenty-seven inches aperture, by Mr. Grubb. Besides this there would be other domes and telescopes devoted to the search for minor planets and comets. A reflector would be devoted to photography, and altogether steps were being taken to promote physical astronomy, which he was afraid would leave England far behind, unless our Government was induced to follow up by rendering help.

Professor Pritchard was then called upon to read a paper on the "New Physical Observatory at Oxford." He said that he had intended to give the Society an account of what they were doing, but after what he had heard of the magnificent preparations that were being made at the expense of the Austrian Government he felt that the efforts that were being made by his little University were of far too insignificant a character to be mentioned. The Professor then sat down, but on being pressed by the President and the Society, he said that it must not be supposed that his University, which was poor, could compete with the resources of a Government like that of Austria. He was sorry that Mr. De La Rue should have appeared to lend his countenance to the scheme of a Government Physical Observatory, which he could only characterise as a "gigantic job." (Applause and much disturbance.) The learned Professor was then prevailed on to give an account of the building and instruments in the new Oxford Observatory, a large photograph of which was displayed at the meeting. The building has considerable architectural pretensions, and consists of two domes, joined by a corridor, in which is the transit-room, a library, and rooms for computers. The instruments are already mounted, work has commenced, and much interest appears to be taken in it by members of the University. The Professor called especial attention to the form of the shutters of the great domes: they were made in three pieces, to slide up one over the other. Round the top of the dome, but not interfering with the opening of the shutter, is ornamental ironwork, which greatly adds to the architectural appearance of the building. The domes are large enough to contain, one of them, a twelve-and-a-quarter inch refractor by Grubb, and the other the large instrument of Mr. De La Rue.

The Astronomer Royal said that, in respect to the best form of dome, he had recently received a letter from Professor Winnecke, stating that he intended at the new observatory at Strasbourg to follow the form of drum dome which had been adopted at Greenwich. With regard to architectural features for an observatory, he felt that in these matters "handsome is that handsome does," and he feared that from his experience the shutters that Professor Pritchard had described would be a never-ending source of trouble to him.

Lord Lindsay said that his experience was entirely in favour of the drum domes; they were less liable to get out of order. He had taken drum domes to Mauritius, and on any future expedition he should take drum domes again. Lord Lindsay then read a paper on the progress of the reduction of his observations of the transit of Venus.—*English Mechanic*.

A MILWAUKEE woman, recently convicted of forgery, applied to a newspaper for the appointment of penitentiary correspondent.

PRESENTATION OF THE FREEDOM OF THE CITY OF LONDON TO THE ASTRONOMER ROYAL.

ON the 4th ult., the freedom of the City of London was presented to Sir G. B. Airy, Astronomer Royal, at the Guildhall.

In addressing the Astronomer Royal, Mr. Benjamin Scott, the City Chamberlain, remarked:—"You, Sir George, have incessantly devoted yourself to the valuable walks of practical Astronomy. It was this view of your public services which very naturally attracted the attention of this Corporation, whose resolution recognises especially 'your eminent services in the advancement of practical science, whereby you have so materially benefited the cause of commerce and civilisation.' By the compilation of nautical tables of extraordinary accuracy, and by the improvement of chronometers, placed for comparison under your observation and correction, our naval and merchant services have been enabled safely to navigate the ocean, to protect and conduct the commerce of this great nation. When difficulties, apparently insurmountable, obstructed the development of navigation by iron vessels, your solution of the magnetic problems submitted to you swept all difficulty from the path of progress in that direction. When the national standards of measure and ponderosity were by accident lost to the nation, you were applied to for the accomplishment of their restoration with that mathematical exactitude which was indispensable, and more recently you undertook the very onerous and responsible task of organising and superintending the expeditions despatched to remote parts of our globe for the critical observation of the transit of Venus, with the view of securing the greatest possible accuracy in the measurements within and beyond our solar system. It needs not that I should assert that from the apparently trifling task of determining the standard yard to the more dignified and difficult undertaking of measuring the sun's distance from our earth, you, Sir George, performed the duties allotted to you to the entire approbation of the Government and the scientific world. The solution of the problem of finding a correct measuring line for the heavenly bodies will not be considered as finally and conclusively settled until the year 1882 shall have passed. Allow me to express the hope that, in unbroken health and unclouded intellect, you may, in your official capacity, be permitted to watch over the completion of this the noblest and most important problem of practical astronomy, with which your name will be honourably associated to the end of time."

Mr. Scott having presented Sir G. B. Airy with a copy of his freedom, the Astronomer Royal replied in suitable terms.

ANCIENT MEASUREMENTS.

(From the New York "Jeweller.")

AT a recent meeting of the Society of Biblical Archæology, a paper on "Ancient Metrology," by Mr. F. R. Condor, C.E., was read. In this paper Mr. Condor indicated the confused and contradictory state of our present knowledge of the subject, and proceeded to establish an absolute metrical base, identifying the barley-corn, which the Hebrew writers state to be the unit of length and weight with the long measure barley-corn and with the Troy grain. The grounds of identification were—(1) actual measurement and weight of full-sized grains of barley at the time of the harvest; (2) determination of specific gravity according to statements made in Hebrew literature; (3) actual dimensions of ancient Jewish buildings, and actual weight of a Babylonian talent now in the British Museum, which corresponded to Mr. Condor's determination of 960,000 Troy grains within one per mille. The remarkable double division of the Chaldee metrical system, which is both decimal and duodecimal, was then explained, and shown to apply to measures of length, area, capacity and weight. The origin of the Troy ounce, the diamond carat, the Spanish mcat, and other existing divisions is traced to the early system employed by the Phœnician traders.

ROYAL MICROSCOPICAL SOCIETY.

A MEETING of the above Society took place on the 3rd ult. H. C. Sorby, Esq., F.R.S., president, in the chair. Three new fellows were elected, and a very interesting paper was read by the president "On a new method of Measuring Bands in Spectra." The secretary also read a paper by Dr. J. J. Woodward (U.S.A.) "On *Frustratia Saxonica*," and some further observations upon the subject were made by Mr. J. H. Slack, and Mr. J. Mayall, jun.

THE QUEEN'S NECKLACE.

From "Temple Bar."

(Continued from page 106.)

ABOUT the year 1781, Madame de Lamotte was first introduced to the Cardinal, at Saverne by the Countess Boulainvilliers. The Cardinal received warmly this young woman, interesting by her age, her figure, her spirit, and especially by the contrast of her poverty with the greatness of her pedigree. He felt astounded at the misery in which the court left the descendants of Henry II., and promised his influence to support their complaints. Shortly afterwards, Madame de Lamotte received 2,400 francs from the funds of the Grand Almonry. Gratitude and her incessant wants often renewed her visits, and the impression which she made upon the Cardinal became more and more deep. The pride of the prince was flattered—not less than his gallantry at the idea of protecting, in a woman so agreeable, a lady so illustrious. He entered into her views, gave her advice, directed her course. He also confided to her the bitterness of his position, the unjust prejudices of Marie Antoinette against him, and his vain attempts to explain his conduct. He revealed to her how impatiently he endured the coldness and disdain of the Queen, of that "woman of proud beauty and of seductive grace;" and gave her an insight into his own strong passions, which were so much the fiercer as they had to be curbed and restrained.

It was at this period that Madame de Lamotte began to propagate the report of her relations with the Queen. She told the Cardinal that Marie Antoinette, having seen her at Madame Elizabeth's, had read her petition with interest, and promised her her royal favour; shortly after this, she added that the Queen had condescended to receive her, and that she had been privately admitted into her Majesty's boudoir. The Cardinal, too dissipated to calculate, too amorous to distrust, too vain to imagine he could be deceived, listened and believed; and went so far as to write an elaborate apology and to intrust it to Madame de Lamotte. Some days after, the latter brought a reply written on a small sheet of paper embroidered with blue vignettes, in which Marie Antoinette is made to say: "I have read your letter; I am charmed no longer to find you guilty. I cannot yet grant you the audience you desire; when circumstances shall permit, I will advise you. Be discreet." Letters and answers succeeded one another; and during the months of May, June, and July, 1784, a correspondence took place between the Cardinal and Madame de Lamotte—a correspondence which included many pretended letters of the Queen.

These little notes, with the blue vignettes, which gradually became less and less cold and reserved, stirred up all the passions which fermented in the heart of the Cardinal. However, if they made him hope everything, no favour had as yet been accorded him. On the contrary, they pointedly impressed upon him that he must have patience, and that the time had not yet arrived when he could publicly, in the eyes of the King and of the court, receive tokens of his return to grace; and, indeed, at Versailles the Queen continued to display towards him the same contemptuous indifference. This waiting drove him to despair. Unquestionably he never doubted the authenticity of the correspondence; but the sentiments which the letters portrayed in such vivid colours, were they real? It was true he could not pass publicly from so deep and long a disgrace into sudden and marked favour; but was there not some way to give him to understand that he was pardoned, and—it must be said, since he dared to think it himself—that he was loved? Perhaps a secret interview might not be refused him? The tone of the letters encouraged him to ask it. At first his fair correspondent hesitated; but at last promised; and the interview took place in the park of Versailles on the 11th August.

On that day, about ten o'clock in the evening, just when it was growing dark and the nearest objects could scarcely be distinguished, a group descended towards the Bosquet de Venus. It consisted of M. and Madame de Lamotte, one Rétaux de Vilette, and a Mdle. d'Oliva; Madame de Lamotte in a black domino, and Mdle. d'Oliva in a shawl thrown over her head. Vilette and Lamotte lagged behind. Madame de Lamotte went away for a moment, whilst Oliva remained in the shade alarmed and embarrassed. Soon after, conducted by Madame de Lamotte, the Cardinal Prince de Rohan appeared, disguised, and followed by a confidential friend, the Baron de Planta. The prince bowed as Oliva presented him with a rose, saying: "You know what that means." The Cardinal took the rose and was about to reply, when a footstep was heard approaching; and Madame de Lamotte, who had gone away for a moment, ran up to them, and in a low and hurried voice said:

"Make haste, make haste away!" Vilette, rushing up to the side of Mdle. d'Oliva, whispered, "Madame Elizabeth and Madame le Comtesse d'Artois are coming."

Two hours after, at the Belle-Image inn, the actors in this scene, so lightly played, were supping gaily at the expense of the unfortunate Cardinal.

This interview was decisive for him; he wished to see, and he had seen. Henceforth no more doubts, no more suspicions, no more *arrière pensées*. From this time he reflected not, neither did he open his eyes; his good sense, his clear-sightedness, his coolness, abandoned him altogether. The dreams of his diseased imagination took a bodily existence and enveloped him as in a cloud. He fell under the dominion of a thought which ruled him pitilessly; he became the blind instrument of a woman who led him captive by every passion of his heart. Henceforth, urged by an irresistible force, he marched onward without looking around him, without seeing or hearing, his eyes incessantly fixed upon that exquisite "image of the Queen presenting him with a rose." He marched onward to his ruin, calm and confident.

August had not passed when Madame de Lamotte demanded 60,000 francs "for a poor and respectable family, in which," she said, "the Queen was interested." The Cardinal immediately borrowed the sum and sent it to Madame de Lamotte by the faithful Planta. In November a new demand was made for a loan of 100,000 francs, in the name of the Queen. This fresh sum was raised in the name of the Cardinal by the baron, who was even authorized to sell some property if additional aid were required.

Madame de Lamotte thus passed suddenly from poverty to opulence. To regulate this transition, however, she went to Bar-sur-Aube, and sojourned there some time. Still she was impatient to display her good fortune and to humiliate by her luxury those who had witnessed her wretched childhood and her absurd marriage. It was not without admiration, then, that the people of the little town saw arrive, "first a heavy-laden *fourgon*, drawn by a fine team and followed by two led-horses of great value; then, preceded by two couriers, M. and Madame de Lamotte in an elegant berlin." Everything was on the same scale of extravagance; Madame de Lamotte wore embroidered silk dresses, and glittered with jewelry; she purchased a house, went so far even as to pay her debts, and liberally distributed alms. Such was the use made of the 160,000 francs; but this was only the prelude: it is time to come to the imperial fraud of the necklace.

(To be continued.)

WATCH AND CLOCK MAKERS' ASYLUM.

THE annual festival of the above named Institution was held at the Agricultural Hall, on the 23rd ult. About 150 subscribers and friends sat down to dinner, presided over by Mr. D. Clarke, chairman of the Committee.

In giving the toast of "Prosperity to the Asylum," the chairman traced its progress from the foundation of the Asylum eighteen years since, and appealed for its support.

A high tribute was paid to the chairman, in the remarks of Mr. S. Jackson, who, in very eloquent terms, proposed Mr. Clarke's health. In the course of his reply, Mr. Clarke called attention to the desire for a fund to endow the Workmen's Memorial Home, and said that he would be pleased to receive subscriptions towards it, at 173, Goswell Road.

We hope that all interested therein will respond to such a deserving appeal.

In order to secure perfectly regular motion in the clock-work applied to revolving lights in lighthouses, Dr. Hopkinson, the scientific adviser of the glassworks of Messrs. Chance & Co., near Birmingham, states that he has introduced a simple centrifugal governor. The governor balls have to lift a heavy weight, which is in the form of a fly-wheel, and the circumference of which, on being raised slightly, presses against certain fixed pads, the friction of which soon diminishes the velocity of rotation of the fly-wheel and the governors sufficiently to allow these latter to fall back to their original position. He calculates that work to the extent of 500 pounds per minute must be done on the governor in order to accelerate the clock one second per hour. This form of governor possesses the advantage that it checks any acceleration of the clock more promptly than when friction rubbers are carried by the governor balls; and it is also easy to adjust."—*New York Jeweller*.

A TREATISE ON PITCHINGS.

(Continued from page 100.)

XXII. We come now to another case, which is much more complicated, but which is also more serviceable in the use, and ought to be nearly always employed, on account of the facility which it gives in the practice. We suppose that the leaf of the pinion CD is a rectilinear plane which passes through the centre C of the pinion, represented by the line CD (Fig. 6), it is required to determine the tooth HDO , which ought to drive the leaf CD , in accordance with the laws of perfect pitching.

Describe a circle CDM , whose radius shall be half of that of the primitive pinion, and suppose this circle movable around the point O , which is its centre, in such a way that the circumference of the primitive wheel MH draws simultaneously the circumference of the pinion, which turns on the point C , and the circumference of the small circle CDM , which turns on the point O , or that the small circle be drawn by the pinion, which comes to the same thing. When the wheel has described the arc MH the primitive pinion will have described the arc MC , which is precisely the same length as MH , and the small circle will have described the arc MD , which is likewise equal to the arc MH , since each point of the wheel has been applied to each corresponding point of the pinion and of the small circle, and has passed over as much of the one as the other. In this movement of the small circle around the centre O the point D of the small circle will describe on the plane of the wheel an epicycloid HDO , Art. XII., and as it rolls also in the pinion, it will describe on the surface of the pinion a right line CD ; or the line MD , drawn from the point of contact M of the two circumferences, is a perpendicular to the epicycloid HDO , Art. XIII., the same line MD is perpendicular to CD , for the angle MDC , being formed in a semicircle, MDC , is necessarily a right angle; thus the line drawn from the point of contact M , of the two primitive circumferences to the describing point D , or contact of the leaf and tooth, will be at one and the same time perpendicular both to the leaf and the tooth, which will satisfy the conditions required. We have therefore this general proposition, if the leaf of a pinion be a rectilinear plane, directed towards the centre, the tooth of the wheel which ought to drive this pinion, taking it only in the line of centres, must be an epicycloid generated by the rotation of a circle, of which the diameter is the half of that of the pinion, on the exterior circumference of the wheel.

XXIII. We are now in a position to pass to a more general proposition, and to demonstrate that the pitching will always have the required conditions. If the leaf and the tooth are generated by the revolution of the same generating circle, rolling within the primitive pinion, in order to describe the leaf, and on the outside of the wheel, to describe the tooth. We may remark that that condition has already taken place in Art. XX and XXII.; for in the first case, Art. XX., the pinion itself rolled upon the wheel in order to describe the tooth; and to describe the leaf, which was only a point, it could only roll within itself, but in an infinitely small quantity, that is to say, not at all. In the second case, Art. XXII., the same circle rolled within the interior of the pinion in order to describe a right line, which we supposed the leaf of the pinion to be, and it also rolled upon the circumference of the wheel in order to describe there the tooth.

XXIV. Let us take, then, any circle DMC (Fig. 7) which shall be smaller than the pinion AME , and of which the centre F shall be always fixed on the line of centres FM ; the pinion, turning from M towards A , and the wheel from M towards B , will draw along the generating circle and the describing point from M towards D ; then the point D will describe an epicycloid ADG on the surface of the pinion, and another epicycloid $B DH$ on the plane of the wheel, Art. XII.;

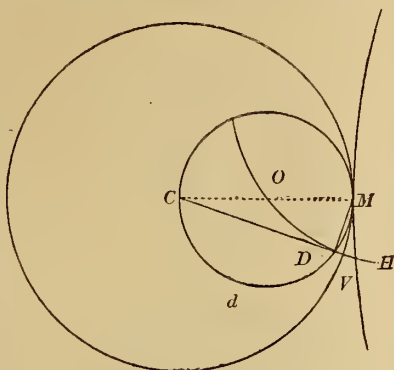


FIG. 6.

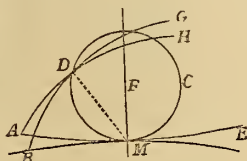


FIG. 7.

those two epicycloids will always touch each other in a point D , since the describing point generates both the one and the other at the same time; the line MD , drawn from the point of contact M to the point D , will be always perpendicular to each of them, Art. XIII.; since the line MD describes at each instant, exceedingly minute, an arc of a circle, of which the centre is M , and which will form an extremely small portion of each of the curves ADG , $B DH$; thus, in giving to the leaf of a pinion the curve ADG , and to the tooth of a wheel the form $B DH$, we shall have fulfilled all the conditions of a perfect pitching, which reduce themselves, Art. XIX., to this, that the line drawn from the point of contact to the driving point be always perpendicular to the leaf and to the tooth.

XXV. As it is advantageous that the leaf of the pinion should be convex as well as the tooth, it is necessary that the generating circle should have a diameter greater than the radius of the pinion, in order that the leaf may be convex on the side of the wheel, as may be seen in Fig. 8, where MB is the wheel, MA the pinion, MD the circle which described on the plane of the wheel the tooth $B DH$, and on the plane of the pinion the leaf ADG ; finally, it will be always more convenient to make from the leaf AD a right line, as we have already said. It may possibly have been remarked, up to the present, that the wheel having driven the pinion, always beginning at the line of centres, the pitching has been ever taken in projection on the circumference of the primitive wheel, which has increased the wheel by the length of a tooth, and that the primitive pinion has been diminished by the quantity of the pitching; the reason being that the perpendicular drawn from the point of contact M to the leaf and to the tooth cannot fall without the circumference of the pinion, nor within the wheel, unless both were concave, which is impossible in use.

(To be continued.)

VENEERED DIAMONDS AGAIN.

WE extract the following from the *Scientific American*:—"Sydney Smith once observed that it required a surgical operation to get a joke into a Scotchman's head. We do not know whether the anonymous individual who has just sent us a letter signed 'A Friend' hails from the land o' cakes; but we fear such must be the case, from the merciless hauling over the coals he inflicts upon us for our innocent remarks on a cheap jewelry swindle. Now the veneered diamond man himself twists our paragraph into a commendatory testimonial, and publishes it as such in his brazen advertisements.

"Seriously, however, for the sake possibly of others who may also have misunderstood our meaning, we may plainly state that the wonderful discovery is a miserable deception. Science has never been able to produce the diamond artificially, though countless attempts have been made. Professor Silliman, by intense heat, has made little transparent globules from plumbago which resembled the genuine stone; so, also, globules have been obtained from apparently fused charcoal, but close examination showed them to contain iron and carbon, which proved that the charcoal had never been perfectly fused. Cagniard de Latour pretended to have discovered the ingredients of the gem; but the small crystals shown by him turned out to be peculiar silicates, which polarized light differently from the diamond. M. Despretz has conducted experiments which are probably the furthest advanced of any. By voltaic action he prepared a pure carbon from sugar-candy, which was deposited in the shape of microscopic crystals in black octohedrons, or colourless translucent plates, the whole of which had the hardness of the powder of the diamond, and which disappeared on combustion without leaving any perceptible residue. Being, however, only in powder, it was impossible to isolate and weigh these crystals, or to determine their index of refraction or angles of polarization, the two tests which infallibly distinguish the true diamond. It is reported, also, but we know of no confirmatory evidence, that a mixture of chloride of carbon and alcohol, when acted upon by galvanic currents for six months, is decomposed with a result similar to the above.

"As regards the ridiculous theory of the humbug we have referred to, certainly no refutation of it is necessary. We have a better opinion of the scientific knowledge of the readers of the *Scientific American*, and of our journal itself as an educator, than to credit the idea that others, beside those few intensely matter-of-fact persons who have written, wondering that we could be so humbugged, will be deceived by so palpable a fraud."

FINGER RINGS.

(Continued from page 123.)

WE have already spoken of the ring-hand and the ring-finger, but have not noted the origin of the custom of placing the wedding-ring on that finger. It resulted from an inaccurate belief that a nerve went from thence to the heart. That the ancients were indiscriminate in the use of their fingers as recipients for rings we have already shown; Mr. Waterton has placed in his curious "Dactylitheca" the forefinger from a bronze statue of late Roman workmanship, wearing a large ring upon the second joint. In Germany it is still customary to wear the ring in this fashion, a custom they evidently borrowed from their Roman subjugators, and have retained through every century of change since then.

As the luxury of Rome increased the wearing of rings increased also, and the emperors relaxed the law of restraint. Thus Tiberias, in A.D. 22, gave permission for gold rings to be worn by all persons whose fathers and grandfathers possessed property to the value of 200,000 sesterces. The emperors Severus and Aurelian ultimately gave the right of wearing gold to all soldiers of the empire, and the Emperor Justinian at length gave a similar right to all who had legal claims to Roman citizenship.

Distinction once broken through, and wealth increasing, ring-wearing became general. Seneca, describing the luxury and ostentation of his time, says, "We adorn our fingers with rings, and a jewel is displayed on every joint." The ridiculous excess to which the custom was carried may be understood from Martial's description of Charinus, who wore as many as sixty rings on his hands at one time, and so fond was he of his jewellery that he kept them upon his fingers when in bed. They were decorated with a vast variety of subjects, originally cut in the metal of which the ring was made, whether gold, silver, or brass; ultimately the devices were cut upon stones and gems, occasionally representing the tutelary deity of the wearer. Thus Julius Cæsar wore one with Venus Victrix upon it, and his partisans did the same. Pompey's ring was engraved with three trophies, indicating his victories in Europe, Asia, and Africa. Many used merely fanciful or emblematic devices, thus Mæcenas had a frog upon his ring. Others wore the portraits of their ancestors or friends. Publius Lentulus had that of his grandfather. Cornelius Scipio Africanus, younger son of the great Africanus, wore the portrait of his father; but, as he was a degenerate son of an illustrious sire, the people gave expression to their disgust at his conduct by depriving him of his ring, saying he was unworthy to wear the portrait of so great a man.

This ring-wearing became one of the troubles of the wealthy, and, as the Sybarite complained of the folded rose-leaf inconveniencing his bed, the rich Roman was fatigued with his rings. Hence came the custom of wearing light or heavy rings, or, as they termed them,



FIG. 19.

summer or winter rings, according to the season. That there really was some reason in the complaint will be granted by the reader who looks on Fig. 19, copied from Montfaucon.* It is a thumb-ring

* "Antiquité Expliquée et Représentée en Figures."

of unusual magnitude, and of costly material; it has upon it a bust in high relief of the Empress Plotina, the consort of Trajan; she wears the imperial diadem, which is here composed of precious stones cut into facets. This bust would of course come outside the hand, the narrower part of the wreathed ring passing between the thumb and first finger. The gorgeous inconvenience of the whole thing is at once apparent. It probably decorated the hand of some member of the imperial family.

The enormous sums expended by the wealthy on rings may be best understood by an allusion to the recorded value of two belonging to empresses of Rome. Thus the ring of Faustina, we are told,



FIG. 20.



FIG. 21.

cost 40,000*l.*, and that of Domitia, 60,000*l.*, reckoning the Roman sesterce at its modern value.

Sometimes the decoration of a ring was not confined to a single gem, though such rings were comparatively rare. Valerian speaks of the *annulus bigemmis*, and Gorleus furnishes us with the specimen engraved in Fig. 20. The larger gem has cut upon it a figure of Mars holding spear and helmet, but wearing only the chlamys; the smaller gem is incised with a dove and myrtle branch. Beside it are placed two examples of the emblematic devices and inscriptions adopted for classic rings when used as memorial gifts. The first is inscribed, "You have a love pledge;" the second, "*Proteros* (to) *Ugiæ*" between conjoined hands—a type of concord still familiar to us.

Though the ancients seem scarcely to have thought of decorating the circle of the ring, they occasionally varied its form, producing novelty at the expense of convenience. Fig. 22 is a whimsical example; it may, however, have been principally used as a signet. The same may be said of Fig. 23, which has a very broad face set with an incised stone bearing a figure of Hygeia.



FIG. 22.



FIG. 23.

The ancients tell us of charmed rings; such was the ring of Gyges, which was reported to have rendered him invisible when he turned the stone inwardly and closed it in his palm. Execætus, tyrant of the Phocians, carried two rings, which he was accustomed to strike together, to divine by the sound emitted what he had to do, or what was to happen to him.

The most curious adaptation of the finger-ring to a double use was made by the Romans. It was a combination of a ring and a key, as represented in Figs. 24 and 25, from originals engraved by Montfaucon in his great work on Roman antiquities. He has published many varieties, for they are very commonly discovered in all places where the Romans located themselves. Many have

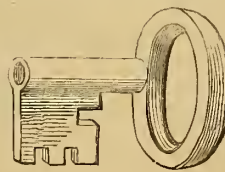


FIG. 24.

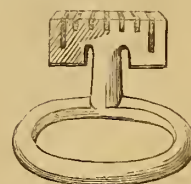


FIG. 25.

been found in London, York, Lincoln, and other old cities, as well as in the neighbourhood of Roman camps. The use of these rings is apparent; they opened the small cabinets or boxes in which the most precious articles were preserved, and they were less likely to

be lost, mislaid, or improperly used by others, when thus worn night and day on the finger.

It is recorded of the poisoning Pope Alexander VI. (Borgia) that he caused a somewhat similar key to be used in opening a cabinet; but the pope's key was poisoned in the handle, and provided with a small sharp pin, which gave a slight puncture sufficient to allow the poison to pass below the skin. When the holy father wished to rid himself of an objectionable friend, he would request him to unlock his cabinet; as the lock turned rather stiffly, a little pressure was necessary on the key-handle, sufficient to give the trifling wound that ultimately proved mortal. Poisoned rings were known to the ancients. When Hannibal, the Carthaginian general, was overcome by Scipio Africanus, it is recorded that he fled to Bithynia and ended his life by poison, which for that purpose he had reserved in a ring.

Rings formed of bone, amber, and glass were provided for the poorer classes, as was the case in ancient Egypt. They were also used as mortuary rings, and are found on the hands of the dead in Italian sepulchres. The Waterton collection supplies us with two specimens. Fig. 26 is of amber, cut to appear as if set with a stone. Fig. 27 is of glass, also made as if set with a jewel. The body of

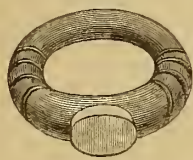


FIG. 26.

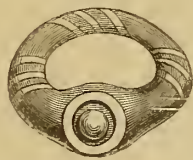


FIG. 27.

this ring is dark brown with bands of white crossing it; the jewel is yellow.

In the later days of the Roman empire the simplicity and purity in decorative design that the Roman obtained from the Greeks gave way to the ostentatious love of gaudy decoration taught at



FIG. 28.

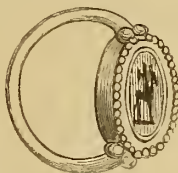


FIG. 29.

Byzantium. Jewellery became complicated in design; enrichment was considered before elegance. The old simple form of finger-ring varied much. Fig. 28 is given by Montfaucon. Fig. 29 is in the Londesborough collection, and was found upon the hand of a lady's skeleton, buried with a child in a sarcophagus discovered, in 1846, in a field near Amiens, called "Le Camp de Cæsar;" on two of her fingers were rings, one of which was set with ten round pearls, the other (here engraved) is of gold, in which is set a red carnelian engraved with a rude representation of Jupiter riding on the goat Amalthea. The child also wore a ring with an engraved stone. The whole of the decorations for the person found in this tomb proclaim themselves late Roman work, probably of the time of Diocletian.

In 1841 a curious discovery was made, at Lyons, of the jewel-case of a Roman lady containing a complete trousseau, including



FIG. 30.



FIG. 31.

the rings here engraved. Fig. 30 is of gold; the hoop is slightly oval, and curves upwards to a double leaf supporting three cup-shaped settings, one still retaining its stone, an African emerald. Fig. 31 is also remarkable for its general form, and still more so for its inscription, "VENERI ET TVTELE VOTVM," explained by M. Comarmond as a dedication to Venus and the local Tutela, the guardian of the navigators of the Rhine; hence he infers these jewels to have belonged to the wife of one of these rich traders in the reign of Severus.

The simplest form of finger-ring worn by the Gaelic ancestors consisted of a band of metal merely twisted round to embrace the

finger, and open at either end. Fig. 32 shows one of them, found in excavating at Harnham Hill, near Salisbury, a locality celebrated from the earliest recorded time as the true centre of ancient Britain.



FIG. 32.



FIG. 33.

The prevailing form of the old Celtic finger-ring is shown in Fig. 33. It is formed of thick twisted wires of fine gold, which fashion seems to have been in most favour with all the early Celtic tribes.

The south Saxons retained to the last the simple form of wire rings, which, as we have already shown, originated with the most ancient people. Fig. 34 represents one of the plainest of these wire rings, and which was exhumed from a tumulus on Chatham Downs, near Canterbury, in 1773, by the Rev. Bryan Faussett, who says the bones were those of a very young person.



FIG. 34.



FIG. 35.

The industry of the same collector furnishes us with Fig. 35, a specimen of a wire ring so twisted as to resemble a seal ring, or one set with a stone; the wire round the finger having been beaten out flat. It was discovered in the extensive Saxon cemetery on Kingston Downs, near Canterbury, on the Dover road.

Ireland seems to have boasted of a higher civilization at an earlier period than the sister kingdoms, her ancient art works being remarkable for their skilled and tasteful elaboration. The Londesborough collection includes two remarkable rings (Figs. 36 and 37) which were found, with other gold ornaments, near the very remarkable tumulus known as "New Grange," a few miles from Drogheda.



FIG. 36.

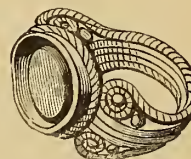


FIG. 37.

They were accidentally discovered, in 1842, by a labouring man, within a few yards of the entrance to the tumulus, at the depth of two feet from the surface of the ground, and without any covering or protection from the earth about them.

Two bracelets of thick twisted gold were found with them. Another labouring man, hearing of this discovery, carefully searched the spot whence they were taken, and found a denarius of Geta, which may aid us in arriving at some conclusion as to the age of these curious works. The stone in both rings is a eut agate.

(To be continued.)

BELLS FOR ST. PAUL'S CATHEDRAL.

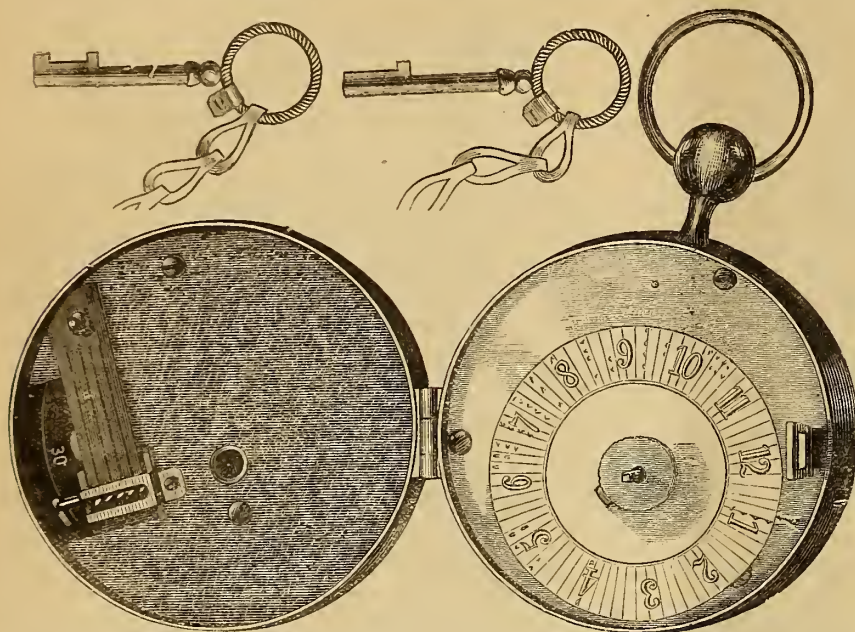
A MEETING was held at the Mansion House, on the 2nd ult., for the inauguration of a fund for furnishing St. Paul's Cathedral with a peal of bells for striking the quarter hours. The Lord Mayor presided, and the Dean of St. Paul's showed that a peal of bells was particularly required.

In moving that it was desirable that a peal of bells should be supplied to the Cathedral, Sir Edmund Beckett, Q.C., cited Bradford, Rochdale, Manchester, Doncaster, Exeter, Worcester, and other towns, and stated that it was not creditable to London that St. Paul's Cathedral should be behindhand in this respect. The resolution was seconded by Mr. Cazenove and carried unanimously.

After some further remarks by Dr. Stainer and others, a committee was formed to collect subscriptions.

"WATCHMAN, WHAT OF THE NIGHT?"

AMONG the recent patents is an ingenious novelty, and valuable perfection of mechanism, in the shape of CONTROL WATCHES, introduced by Messrs. M. Selig, Junr. & Co., and admirably designed



to indicate punctuality, as well as register its neglect.

Time after time scores of lives have been sacrificed through the simple neglect of a watchman, who, relying on the absence of any record of his inattention, heedlessly violated the trust reposed in

him, and through his negligence sent many an unsuspecting victim to his grave. However well organized the arrangements in warehouses, factories, mines, prisons, or on board vessels, may be, yet to a second or third party they furnish no proof that the watch has been properly observed at the stated periods. As a check against neglect of such duty, the control watch introduced by Messrs. Selig & Co. will be found of the greatest value, as it is calculated to compel the watchman to do his duty, and by such means prevent numerous accidents, often attended by most serious and fatal results. The arrangement of the watch is shown in the accompanying illustration.

It is wound up every day, and one of the paper dials put in, which is fastened by means of the knob on the axle; it has to be regulated in accordance to the actual time and to the engraved arrow at the side, the key must remain in the hands of the head-man. Every one on duty gets a key, each key being different and furnished with a projection to act only on the spring belonging to it. Every ten, twenty-five, or forty-eight minutes, or every hour, in accordance with special arrangements, the watchman has to turn his key once in the key hole which makes a sharp pointed pin move towards the paper dial and makes its own distinctive mark upon it. Every twelve hours—when the watch is over—the paper dial is taken out of the watch it will record for every watchman IF, WHEN, and HOW OFTEN he has done his duty. Should one person have to control several places it can likewise be attained by giving the watch to the man to carry and by fastening the keys to the different places.

Captain Wilson, of the "Eagle" line of transatlantic steamers, writes that "these control watches have proved themselves to be particularly practical, useful and secure for the exact controlling of men on duty."

SHOW-CASE MAKING.

HAVING recently made a visit of inspection to the factory of Mr. Jefferys, 103, Hatton Garden, and examined the various processes, we are further confirmed in our opinion that show-case making has become an art of some position. The interminable inventing and scheming from the tiny stand of a diamond ring up to the great sixteen feet case, to show the goods placed in them to the best advantage, would surprise the uninitiated. With respect to the cases for the smaller articles of jewellery that the purchasers carry away with them, such as are for watches, ear-rings, lockets, rings, bracelets, &c., there is considerable ingenuity and tact brought to bear. In some instances, such as for goblets, and mugs, the case is built up like a cask, then sawn through, and afterwards covered with leather and lined with satin, or velvet. Some white silk velvet was shown to us at the price of five-and-twenty shillings a yard. For other articles the shape has to be cut out of the solid wood, and then covered. In the covering some handy fingers have to be employed, and, as may be guessed, these belong to what a sensitively polite friend calls the "lady gender." They sit round a large circular table, in the centre of which is a goodly sized glue pot kept liquid by gas underneath, and the lady neatly "dabs" on the covering or lining, as the case may be, with a rapidity that only practice can give. The wonder is that such costly satins and velvets can be so quickly handled without the glue getting upon the wrong side. Whilst we were there a messenger came in with an 84-carat diamond to have a case fitted to it off hand. It was said to be the largest "clean" diamond that had come from the South African fields. Perhaps the more out-of-the-way country jewellers have not as yet taken to the amusing but effective optical illusions of their more advanced brethren. In one that we saw, several sides of silvered glass were set up round a velvet "banking," and a bow plate front. On the bank were a number of pins for rings. Place a ring upon one of them, and look through the bow-plate, you will see no fewer than four rings, the attractive power of which in a shop window need not be argued.

Passing into a room we saw a show-case six feet by two feet,

with rounded ends, lined with chequered pattern-quilted scarlet coloured satin. It looked very tasteful, if not bordering on the grand, the highly-polished finish setting it off well. Adjoining it were what are called "country cases" for general purposes. These cases we were told could be made from six feet to sixteen feet in length; indeed, we saw one case having for its cover a single plate ten feet long. After that length it is considered prudent to put bearings in to preserve the glass from the chance of breakage either by weight or jarring. We saw several cases that had done duty at the Vienna Exhibition; and were having their ebony repolished and their gilding touched up to be ready for service in other quarters. These were upright, wardrobe-shaped ones, standing by themselves, with plate glass on all sides, fixed in a framing of twisted ebony pillars capped and gilt. They looked very handsome. We also noticed a large square case with a canopy over it that was being built for the Philadelphia Exhibition. The place for the attendant was in the middle, the counter being all round. One feature which is cultivated as a specialty by the firm, is the manufacture of outside reflecting shop-lamps. Upon going upstairs we were shown the method of tennoning the frame-work, and also the grooving for the glass plates so as to produce an air-tight and dust-tight case—for all the cases possess those properties. Some polished glass plate edges and bevelled require a word. We saw several with the edges as smoothly polished as the surface, the lines being curved as well as straight. The mode of bracketing glass shelving almost invisibly is interesting, and displays considerable adaptability.

Gold lettering on glass tablets is another part of the business, and some very finely-wrought specimens were shown to us. We were informed that the utmost care was taken in the production of all work that came to the front; indeed, the articles themselves showed as much when closely looked at. Upstairs the men were at work upon an order for a large number of single lavatories for a new hotel. They are made of white pine and highly polished, being "picked out" with ebony.

We were very much pleased with what we saw, and as there are secrets in every trade, so are there in that of show-case making. We saw them, and promised not to divulge them, a promise which we most religiously mean to keep.

COVENTRY ENTERPRISE. ERECTION OF A NEW WATCH FACTORY.

NOW that watches made by machinery are being extensively introduced into England, the manufacturers in this country are commencing to bestir themselves, and endeavouring to compete with their foreign rivals. It is, therefore, a matter of interest to chronicle any step taken by the leading houses at home; and in the present instance we may with every propriety draw the attention of our readers to the extensive and well-arranged factory recently erected at Coventry, by Messrs. Newsome and Yeomans, of that town.

Coventry is well-known as the chief seat of watchmaking in England; that branch of industry having been commenced there early in the eighteenth century.

In 1727, George Potter, a watchmaker, was mayor of that city, where there are now several large watch manufactories, in one of which steam-power is employed for turning, polishing, and other purposes.

Having recently had an opportunity of personally inspecting the premises alluded to, we found them most admirably constructed for light, ventilation, and warmth, as well as for the health and comfort of the employées.

On entering the building we pass through a well-arranged lobby to the offices situated on the first floor of the establishment, immediately in front of which (and separated only by a partition consisting almost entirely of glass) is the main workshop or finishing room, 120 feet in length, and accommodating over fifty workmen. This workshop is directly under the eye of the principals in an adjoining office, and is constructed with every regard to the requirements of the men employed.

A watchmaker's occupation being of exclusively a sedentary character, badly ventilated, or non-sufficiently or overheated workshops become extremely injurious to the workman, who has to pass twelve hours every day at his bench; and in this respect Messrs. Newsome and Yeomans have succeeded in adopting every possible measure which could tend to the benefit of those employed in their establishment. The other workshop is situated on the ground floor, and is about forty-five feet in length. Both are provided with "Howarth's Patent Ventilators," admitting pure air from below, and carrying off all foul air from the top. These ventilators enable the room to be regulated to any temperature, and which is a great advantage not hitherto enjoyed in most watch manufactories, the absence of which has so greatly tended to the ill health of the employées. Another great improvement which we noticed is that of a separate coat room which enables the workmen to leave their coats and hats therein, and obviates the disagreeable custom of the men hanging their damp overcoats around the workshop. The cloak room being heated the coats and hats of the men become thoroughly dried during the working hours. In addition to this advantage, the principals have provided a tea room comfortably fitted up, and in which are placed several books and periodicals, enabling the men to take their tea with every comfort without leaving the premises. Altogether the factory is certainly one of the most complete, although not the largest, which we have inspected. We also noticed the great advantage of the factory being heated by means of hot air. This must be far better than the ordinary method, as the work can doubtless be better polished and put together when the dust, ashes, and smoke of a stove are dispensed with, besides which it ensures a uniform temperature throughout the workshop.

The principals of the establishment are thoroughly practical men, who devote their attention to the production of a good durable watch, at a reasonable price, so as to keep pace with those imported from abroad. Their watches are all made to gauges, a system having many decided advantages, the chief of which is, that in the event of any wheel or pinion being broken or lost, it may easily be replaced without sending the entire watch, and by the aid of machinery they are enabled to produce their articles at moderate figures. One special branch of their extensive business is the manufacture of the higher class gold $\frac{3}{4}$ plate, centre seconds, keyless, and other description of watches, on all of which special care and attention is bestowed. On the 30th ult., the completion of their new premises was celebrated by a dinner, the following account of which is quoted from the *Coventry Standard*:—

"On Saturday evening last the employées of Messrs. Newsome and Yeomans, watch manufacturers, and their friends, to the number of about 120, met at the Craven Arms Hotel to celebrate the opening of Messrs. Newsome and Yeomans' new watch factory by a dinner, the cost of which was defrayed by the gentlemen

at the head of this enterprising firm of watchmakers. Mr. I. J. T. Newsome presided, and Mr. Samuel Yeomans occupied the vice-chair. Amongst those present were Major Caldicott, W. R. V., T. Dewes, Esq., District Coroner, the Rev. G. Tabberer, Vicar of St. Peter's, Coventry, Mr. H. B. Francis (manager of Lloyd's local bank), Messrs. J. Oswin, S. Freeman, J. Dowell, W. J. Newsome, S. Yeomans, sen., W. Norris (builder), &c., &c. After a sumptuous repast had been served up in Mr. Claridge's excellent style, the Chairman gave "The Queen" and "The Prince and Princess of Wales and the rest of the Royal Family"—toasts which were loyally drunk by the company present.—"The Army, Navy, Yeomanry, Militia, and Volunteers" was next proposed by the Chairman, and responded to by Major Caldicott, who was received with loud applause. In the course of his observations the Major said the Coventry volunteers were as efficient as the volunteers in any other place in England, and he was very proud of his company and battalion.

"In conclusion Major Caldicott proposed the toast of the evening, 'Health, long life, success, and happiness to Messrs. Newsome and Yeomans' (loud applause). They were celebrating an event which was an important epoch in the life of Messrs. Newsome and Yeomans, who, after many years of hard work and much anxiety, had been so successful as to complete the erection of a large factory, which had been so constructed as to afford the workpeople in their employ the greatest possible amount of convenience and comfort. After commenting upon the consideration of Messrs. Newsome and Yeomans for their employées, he expressed a hope that other manufacturers would follow their example, and that ere long we should see many such factories as theirs in our old city. He concluded an excellent speech by proposing the toast which was received with great enthusiasm, and suitably responded to by Mr. Yeomans. Other toasts were given and duly responded to. During the evening, which was a very enjoyable one, the proceedings were enlivened by a number of excellent songs and glees, sung by a glee party, consisting of Messrs. Wood, Gregory, Capp, Smith, and Jones."

THE SUPPOSED UNLAWFUL POSSESSION OF JEWELLERY.

JAMES BULLOCK, who described himself as a dealer, of 21, Church-street, Soho, charged with being in possession of a diamond pin, and not giving a satisfactory account of the same, was again brought before Mr. Newton. Mr. Montagu Williams appeared for the defence. From evidence already given it appeared that Detective-sergeant Butcher followed the prisoner into a tavern in the Haymarket, and charged him with being in unlawful possession of a pin that he was wearing, and the prisoner said he bought it at Debenham's Auction Rooms three years ago, and that he had been in the constant habit of wearing it. The prisoner then handed Butcher a diamond pin, a horse-shoe pin set with white sapphires, a small necklace and locket, and some rings, one with the stone taken out. At the station, on searching the prisoner, the constable found two 5*l.* notes, besides which he was wearing a watch, chain, and locket. The prisoner said he could prove where he bought all the articles, and gave the detective a key, telling him that on going to Mr. Hack's, 21, Church-street, he would find a bag which the key would open. On the constable opening the bag he found a box containing seven watches, three having the bows off, and there was one bow in the box, and some rings and loose stones. In the bag there were also two rings, one of which had seven stones in it, and the other nine. Some of the watches had the glasses broken. In all, there were nineteen watches in the bag, a pair of black opera-glasses, and other property. On the case being resumed at the Marlborough-street Police Court on the 8th ult., Detective-sergeant Butcher asked for a remand, stating that he had made inquiries at different jewellers, amongst others at Messrs. Goddard's, and he believed he should be able to get further information, the pin being mounted in a style called a ducal crown, and such pins not being commonly made.

A gentleman, who stated that he was a diamond merchant, stepped forward and asked that some articles he had entrusted the prisoner with on approbation might be returned to him—the articles being a cluster diamond ring and a pendant.

Mr. Newton told the applicant that as he was going to grant a remand, he had better wait till the next occasion.

Mr. M. Williams asked Mr. Newton whether he would take bail.

Mr. Newton replied in the negative, and remanded the prisoner.

THE

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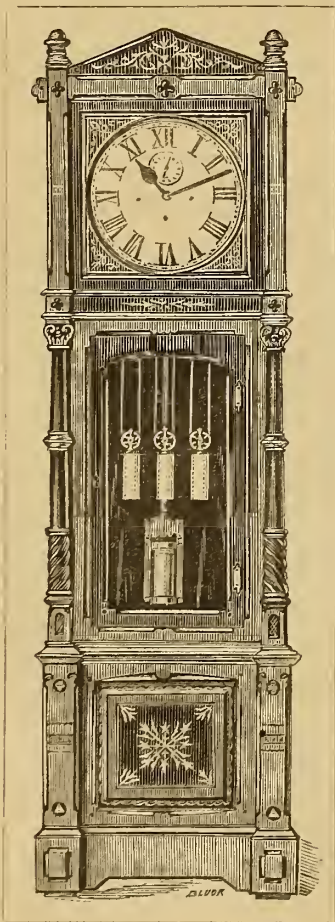
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NOVELTY IN CLOCK CASES.

MESSRS. SWINDEN & SONS, of Birmingham, have recently registered a very handsome pattern clock case, the design of which is given in the accompanying drawing. It is manufactured of pollard oak, with a carved and plate glass. clock for which is a movement on eight bells, hours on a regulator with pendulum, and with the hour hands on the arbour in the The case is of merit, and come general

These clocks revival of the eight-day case have the noble with the sun in the upper one of them hall of a house a fine, substantial piece of furniture. It was that the late ens thus wrote: cheerful, com- clock! How vey to others comfort and that this old for years to other thing life could does? (I will few things proved the true, untiring often have I winter even- society in its how often in the summer twilight, when my thoughts have wandered back to a melancholy past, have its regular whisperings recalled them to the calm and peaceful present!"



PATENTS.

Applications for Letters Patent.

3677. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an invention of "An improved diamond holder and method of inserting, fitting, and securing diamonds in metallic holders."—A communication to him from abroad by Joseph Wild Branch, of Saint Louis, Missouri, United States of America, Manufacturer.—Dated 22nd October, 1875.
3690. WILLIAM GEORGE WHITE, of New Malden, in the county of Surrey, Engineer, for an invention of "Improvements in the manufacture of steel safes and strong room doors, and in the mode of fastening them, parts of which improvements are applicable to iron safes."—Dated 25th October, 1875.
3881. THOMAS PERKS, the younger, of the firm of Thomas Perks & Sons, of Birmingham, in the county of Warwick, Jewellers, for an invention of "An improvement or improvements in earrings."—Dated 8th November, 1875.

Notices to Proceed.

2310. And ALFRED LITTLEHALES, of Birmingham, in the county of Warwick, Engraver, has given the like notice in respect of the invention of "Improvements in fastenings for solitaires, sleeve links, shirt and other studs, cravats, neck-ties, neck and other bows, and other articles."
2335. And AUGUSTE CONOD, of Lausanne, Switzerland, now of 8, Southampton Buildings, London, Watch and Clock Manufacturer, has given the like notice in respect of the invention of "Improvements in electric clock apparatus, parts of which are applicable to ordinary clocks."
3626. SAMUEL CHATWOOD, of Bolton, in the county of Lancaster, Safe and Lock Engineer, has given the like notice in respect of the invention of "Improvements in safes and strong rooms and in locks and apparatus connected therewith, some of which improvements are applicable to other purposes."

Grants of Provisional Protection for Six Months.

3227. To LOUIS MARIE DETENRE, of the city of Paris, in the republic of France, Gentleman, for the invention of "Improvements in the manufacture of imitation jewellery set with stones."
3591. To CALEB LAWRENCE SHAW, of Birmingham, in the county of Warwick, Manufacturing Jeweller, for the invention of "An improvement or improvements in the construction of lockets."
3662. To WILLIAM JEPHCOCK, of Birmingham, in the county of Warwick, Watch Maker, for the invention of "Improvements in the cases of watches, clocks, timepieces, lockets, and other similar articles."
3940. To EDMUND JOHNSON, of 94, Grafton Street, in the city of Dublin, for the invention of "Improvements in ear pendants."

Patents Sealed.

1928. THOMAS WILLIAM GREAVES, of Birmingham, in the county of Warwick, for an invention of "Improvements in solitaires."—Dated 26th May, 1875.
2194. WILLIAM BROOKS, 62, Chancery Lane, in the county of Middlesex, Patent and registration Agent, for an invention of "Improvements in watches, chronometers, and such like time keepers."—A communication to him from abroad by Frederic Fitt, of the city of Ottawa, in the county of Carleton, in the province of Ontario, in the dominion of Canada.—Dated 15th June, 1875.
2052. MATHIAS PETERSEN, of Altona, Prussia, for an invention of "An improved chronometer escapement."—Dated 4th June, 1875.

Patents which have become Void.

LETTERS PATENT for INVENTIONS which have become VOID by reason of the Non-payment of the additional Stamp Duty of 50l., before the Expiration of the Third Year from the date of such Patents, pursuant to the Act of the 16 Vict., c. 5, sec. 2.

3129. WILLIAM HENRY GOSS, of Stoke-upon-Trent, in the county of Stafford, Manufacturer, for an invention of "Improvements in manufacturing articles of Jewellery, dress ornaments, dress fastenings," &c.—Dated 23rd October, 1872.
3256. THOMAS WALKER, of Birmingham, in the county of Warwick, Manufacturer, for an invention of "Improvements in fastenings for scarfs, ties, cravats, and other articles of dress."—Dated 2nd November, 1872.

Patents Granted in British Colonies and Dependencies.

CANADA.

4889. JACOB E. BUERK, of Boston, Mass., U.S., for "A watchman's time detector." (Indicateur de quart.)—5 years.—Dated 24th June, 1875.

Patents Granted in Foreign States.

FRANCE.

- 106,632. DESSENDIER, for "Opening watches with slide ring eyes."—Dated 30th January, 1875.
- 106,674. KNAUST, for "Economic cocks."—Dated 3rd February, 1875.
- 106,761. BENOIST and THEVENOT, of Besancon, for "A lathe with multiple fixed gravers for watchcases."—Dated 2nd March, 1875.
- 166,789. VUILLEMIN, of Crangot, for "Improvements in clock work."—Dated 1st March, 1875.
- 106,809. LEVAVASSEUR & LAVERDURE, for "Improvements in Jewellery articles, small bronze and fancy articles."—Dated 15th February, 1875.
- 106,834. DUTERNE, of Damery, for "Improvements in the manufacture of tower-clocks."—Dated 9th March, 1875.
- 106,878. LABOUREAU, of Paris, for "For fastenings for ear-drops and studs."—Dated 19th February, 1875.
- 106,907. LEIMANN, of Paris, for "A chemical product for facilitating jewellery work, &c."—Dated 23rd February, 1875.
- 107,046. Mrs. SOLDANO, for a "A clock-work for travelling clocks striking the quarters and with minute repeaters."—Dated 3rd March, 1875.
- 107,281. Mrs. REDIER, of Paris, for "Improvements in clock-making."—Dated 13th March, 1875.
- 107,282. REDIER, of Paris, for "A tell-tale for watchmen."—Dated 13th March, 1875.
- 107,421. YBRY, of Tourzel, for clock-work."—Dated 1st May, 1875.
- 107,509. MARTI & MARTIN, for "A machine for cutting pieces of clock-work, &c. by hand or automatically."—Dated 1st April, 1875.
- 107,533. GUILLAUME, of Paris, for "Watches that can be worn as medallions and watch trinkets."—Dated 5th April, 1875.
- 107,621. CLARKE and SMITH, for "Improvements in treating ores, minerals, and other bodies containing metals, to obtain gold, silver, and other products therefrom, and in the apparatus employed therein."—Dated 12th April, 1875.—(English Patent, 26th December, 1874.)
- 107,668. MATTHEY, for "A spring remontoir for watches, clocks, &c."—Dated 19th April, 1875.

(Certificates of Addition.)

- 106,632. DESSENDIER, for "An opening-watch, with a slide eye-ring."—Dated 3rd February, 1875.
- 105,630. LEPAIRE, for "Manufacturing eye-glasses and opera-glasses."—Dated 6th February, 1875.
- 105,402. LAHMEYER and FRANCHETTE, for "Improvements in the construction of mysterious clocks."—Dated 8th February, 1875.
- 92,966. LEVY, for "Watch-keys."—Dated 4th March, 1875.
- 103,950. MAUX, for "Regulation of watches."—Dated 10th April, 1875.

BELGIUM.

- 37,934. J. CHALLENGER, for an imported invention of "Improvements in apparatus for illuminating clock-dials, &c."—Dated 27th September, 1875.—(French Patent, 24th September, 1875.)

ITALY.

19. D. F. DORMOY, of Couthenans, for "A system of stopping watches."—6 years.—Dated 5th April, 1875.

UNITED STATES.

- 167,872. E. BOURQUIN, of La Heutte, Switzerland, for "Escapements for watches."—Application filed 24th July, 1875. *Brief*.—"An escape-wheel, formed with two rows of reversely-inclined teeth, acts upon a single pallet instead of the two commonly used."
- 167,925. T. D. OSBORNE and W. W. LE GRANDE, of Louisville, Ky., for "Watchmen's time-checks."—Application filed 21st August, 1875.
- 167,963. Clock Cases.—W. N. WEDDEN, Waterbury, Conn. *Brief*.—"A sash for clock fronts formed, from a single piece of metal, the shoulders being produced by doubling the metal inward."
- 168,065. JOHN J. THORNTON, of Cleveland, Ohio, assignor of one-half of his right to Dan H. Ridgway, of the same place, for "Compound balance-staffs for watches."—Application filed 18th May, 1875.
- 168,185. DAVID ROUSSEAU, of New York, N.Y., assignor, by mesne assignments, to Wm. F. Smith, and S. Samuels, of the same place, for "Electric circuit-breaking clockwork."—Application filed 13th August 1875. *Brief*.—"The circuit-breaking train of wheels acts only at the time when, in the course of the revolution of a pin-wheel in the time-keeping train, the pins have advanced sufficiently to allow the escape of an arm projecting from a spindle of the circuit-breaking train."
- 161,429. CHARLES TESKE, of Saratoga Springs, N.Y., for "Watch-regulators."—Application filed 19th August, 1875.
- 168,527. GEORGE P. REED, of Melrose, Mass., for "Watch-keys."—Application filed 15th September, 1875.
- 168,581. ALBERT H. POTTER, of Chicago, Ill., assignor of one-half of his right to J. H. McMillan, of the same place, for "Barrel-arbors for watches."—Application filed 11th August, 1875.
- 168,582. ALBERT H. POTTER, of Chicago, Ill., assignor of one-half of his right to J. H. McMillan, of the same place, for "Escapements for watches."—Application filed 11th August, 1875. *Brief*.—"Arranging the trip-spring in a chronometer-escapement at an acute angle to the lever carrying the locking-pallet, by attaching it to a radial arm on said lever."

- 168,583. ALBERT H. POTTER, of Chicago, Ill., assignor of one-half of his right to J. H. McMillan, of the same place, for "Compensation-balances for watches."—Application filed 11th August, 1875. *Brief*.—"Auxiliary bows, having their inner portion brass and outer portion steel, are pivoted to the arms of the balance to provide additional compensation."
- 168,620. E. C. COVELL and M. M. ROBINSON, of Laconia, N.H., for "Lockwork attachments for clocks."—Application filed 21st September 1875. *Brief*.—"Device for permitting the hands to be turned backward without operating the striking mechanism."
- 168,774. Watches.—EUGENE J. PACAUD, Schuffhausen, Switzerland. *Brief*.—"A screw, threaded at its inner end, and provided with a flange, the latter being located between the dial and top plate of a watch, and acting in combination with an elbow lever."
- 168,855. JOHN N. THOMSON, of Providence, R.I., for "Bracelets."—Application filed 9th November, 1874.
- 169,224. S. Wm. BABBITT and HENRY B. BEACH, of West Meriden, Conn., assignors to the Wilcox Silver-plate Company, of the same place, for "Spoon-holders."—Application filed 5th August, 1875.

Trade Marks registered in the United States of America.

2979. SCHWOB, Brothers, and Co., of New York, N.Y., for "Watches."—Application filed 8th July, 1875.
"Congress Watch, New York."
2980. LOUIS STRASBURGER & Co., of New York, N.Y., for "Watches."—Application filed 11th August, 1875.
"Words 'Leopold Huguenin' in connection with the figure of a locomotive."
3022. THE SOUTHERN CALENDAR-CLOCK COMPANY, of St. Louis, Mo., for "Clocks."—Application filed 20th August, 1875.
"Word or name 'FASHION'."
3089. H. MUHR'S SONS, of Philadelphia, Pa., for "Finger rings."—Application filed 22nd September, 1875.—Case A.
"Representation of a crown and a lion."
3097. THE VULCANITE OPTICAL INSTRUMENT COMPANY, of New York and College Point, N.Y., for "Spectacles, eyeglasses, and other optical instruments made of hard rubber."—Application filed 28th September, 1875.
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8742. HERMANN J. MULLER, of New York, N.Y., for "A clock-case."—Application filed 25th September, 1875.—Term of patent 14 years.

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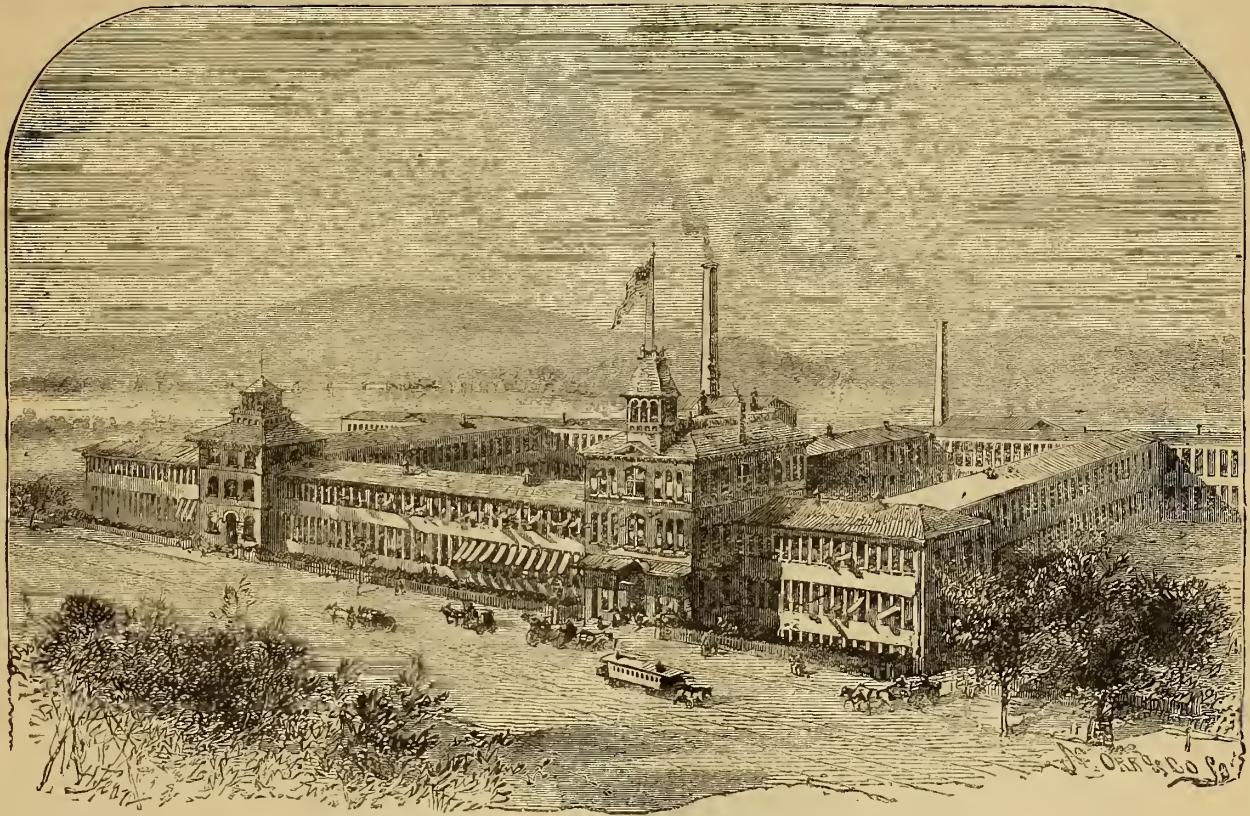
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HOROLOGY.

(Continued.)

VIII.—DIALLING.

SINCE we last wrote we have been asked how to set about dialling in a practical way, the cost of the requisite tools, how to handle them, &c., in fact, to give an elementary lesson at the bench, as it were. It appears that many of our readers have little plots of gardens in open parts of towns, and they would like to amuse themselves and ornament their homes in such a useful manner. We concluded our last with: "A bit of a school slate, a rule, a pair of compasses, a word or two about the meridian of the place, and—there it is."

They smile and say, "Yes, there it is, but that is just where we are not. We want a little more information if you please, before you go any farther. As the year will shortly be on the turn, we should like an Easter sun to shine upon a little garden dial of our own making." That is all very fair, and we have great pleasure in complying with the request as far as we can. The only real difficulty is with the meridian for the particular place of each particular dial; however, we will see what can be done.

The best way to begin will be to procure a pair of compasses for taking off distances, and, if suitable to the strength of your pocket, a second pair to carry a pencil, if not, then the first-named pair must be one of those that have an extra half leg to carry a pencil-point. The advantage of having two pairs is that you need not be continually pulling out the dividing to put the pencil one in. Next

to the compasses get a nice flat rule—if with bevelled edges so much the better—about eighteen inches long. Most artisans have a "two-foot" of some kind; we always carry one ourselves, and find it uncommonly handy at times. Having thus furnished yourself, the best way will be to try your skill on paper. Get a bit of drawing-sheet and either glue or tack it on a small board. Then, with your rule and pencil, mark off exactly the size of the dial that you intend to construct, making an hour-line border to give neatness to it. We are now going the simplest way to work, assuming that we face the south exactly, and that the dial is to be a horizontal one with the style that is to cast the shadow standing up in the centre. Draw a line from left to right that shall equally divide the dial face and will serve for the eastern and western hours. Straight across at right angles, through the same central point, mark off a space equal to the thickness of the edge of your style, probably one-tenth of an inch. This space will evenly divide the dial into an eastern and western side. We next extend what we will call the upper line of the square to double its length. We will call the central point of the square A, the terminations of the style bed C and E, and the extended upper line G to H. We draw a line from A obliquely to the right, equal to the latitude of the place, which we can mark off by means of a semicircular flat brass instrument, called a protractor. This line will cut the prolonged one G H, and we mark the point as B. Then the angle C A B will represent the latitude of the place. It has, also, to be observed that the upper edge of the style should represent the axis of the earth, which will be the case if it is made so that that edge shall correspond in its slope with the angle of latitude already mentioned. The earth is so minute an object when compared with the enormous distance of the sun, that the time shown upon a dial is the same as, supposing the earth's axis to be real instead of

imaginary, and the earth to be, say, of glass, the sun would shadow by shining upon the axis itself. Consequently the style of a dial is always placed parallel to the earth's axis, whatever position the dial may be calculated for. Upon the line A B, from C, draw a line to represent the angle of the equator, and at the point where it cuts A B, call it D. Then, with the compasses open to the length of C D, prolong the line C beyond the square, and call it C F.

We now come to an important operation which will require a few preliminary words. First of all, there is but one equator, although there are many meridians, every place having a different meridian to the places east and west of it. The circle of the equator divides the earth into northern and southern hemispheres, whilst the meridian circle cuts it into eastern and western halves at that particular meridional point. The meridian, then, is the place where the sun is at its greatest height for the day in the journey from east to west, and is called the noon of that place. The circumference of the earth is divided into 360 degrees, and, as the earth turns round once in twenty-four hours, each of these degrees will in turn pass under the sun and constitute the meridian, or noon, at that instant. As every degree takes four minutes of time, therefore fifteen degrees would just occupy an hour. Popularly we say that the sun travels from east to west; those to the east of us have their noon before we have it, and those to the west have it after us, whilst those on the same meridional line have their noon with us. Thus when it is twelve o'clock in the day at London it is twenty minutes past nine in the evening at Melbourne, in Australia, and about seven o'clock in the morning at New York. But we need not pursue this part further; its relevancy to what follows will be seen.

Now take the compasses and mark off 15 degrees from the line of the style at C, which we will call the noon line, to the right on the line G H; that point will be one o'clock. Go on from there in the same way for other hours; then from the centre, A, draw lines to meet those on G H, which will be the hour-lines of one, two, and three, afternoon. Do the same thing on the G side of the line, which will be eleven, ten, nine, in the forenoon. The other hours are found by taking the horizontal line from A to the left equal to the excess of A C, above C D, and make the angles also of six, five, four on the right side equal to 15 and 30 degrees respectively. Then take six, seven, and six, eight, equal to six, five, and six, four, &c.; and, drawing seven and eight for morning and evening, after the same proportions, the whole of the hour-lines from four in the morning to eight in the evening will be completed, and you may set up your dial.

We will now treat of the vertical dial. The meaning of the term is from *vertex*, the turning-point at the top. Of these dials there are many varieties, depending upon what vertical may be pitched upon; the principal ones, however, are the prime vertical and the meridian. From these, again, radiate south, north, east, and west.

Dials which lie on the cardinal points of the compass just named are called direct dials. If any other vertical is chosen the dial is said to decline. If the circle whose plane is worked upon should be perpendicular to the plane of the horizon, which is the position assumed in all those which we have now mentioned, then the dials are particularly denominated "erect;" thus, erect north, erect south, &c. When otherwise, the plane being oblique to the horizon, they are said either to *incline* or *decline*. An erect south dial, when particularly described, is that on the surface of the prime vertical circle, and has a southern aspect. It must be understood here that, since the sun shines on the plane of the prime vertical dial looking towards the south, when on his daily path, he consequently passes from the prime vertical to the meridian. In this we have solar illumination six hours before and six hours after noon; therefore a south dial will show the hours from six in the morning until six in the evening, and, of course, embracing the whole of the winter half of the year. Let us now try and set out the lines for such a dial.

Take a plate of the intended size, and, having squared it, draw a line down on the central diameter. This line we will call the meridional one, marking the upper point as A. About one-fourth the distance below A, and mark it C, and another below that, E; draw from C, a short distance to the right hand, another straight line, marking it D. The lines now connecting the three letters will make an angle, C, A, D, equal to the elevation of the equator. We then draw another line, A to D, to join the one from right to left, that is, from C to D; and from D we draw obliquely, towards the left, another line, so as to make this new angle, C, D, E, equal to C, A, D, which, as stated above, is the angle of the equator. What will now be seen will, by lying on its side, with the point to the right hand and the open part to the left, be a figure like a large V; thus ∇ , having a line straight down the centre. This is the

line C D; and the other lines making up the double triangle are, of course, from A to D, and from E to D, the letter D being the point, as it were, from which all the lines now branch.

We will step on one side for a moment, in order to be as plain as possible. The angle A, D, E, with that part of the meridional line from A to E, form what is called in geometry an equilateral triangle, or one having equal sides. But the line C D through the centre of it entirely changes its character, in fact demolishes it as an equilateral triangle altogether. This line C D what is called "bisects" it, cuts it in two, and converts each half into a right-angled triangle, having different properties altogether. The theorem of a right-angled triangle is as follows:—"In any right-angled triangle the square described upon the hypotenuse, or side opposite to the right angle, is equal to the squares described on the sides which contain the right angle." The hypotenuse, signifying that which stretches under, is the sloping line stretching underneath the other two lines and enclosing the angular space made by them. This figure forms the celebrated problem known to geometrical students as "the 47th of the 1st," or the 47th problem of the First Book of Euclid. If the student will add three other sides to the hypotenuse, and make a square, and, also, make two squares of the two remaining sides of the figure in the same way, he will begin to see the nature of it. This problem is said to have been discovered by Pythagoras, a famous Greek geometer, whose name has become immortalized by it. It is related of him that upon its discovery he was so transported with joy that he sacrificed a hundred oxen to the gods for having put it into his head.

We will now return to our dialling. Right across the plate, in mid-distance from left to right, draw a line and mark it G H; this line, in fact, will be at right angles to the meridional line, and with it will cut the dial plate into four quarters. We go down the meridional line with the compass from E to a distance equal to that of the oblique line E D, and call it B. With this distance we place one leg of the compass on B and describe a quadrant on the right-hand side, the lower point of which mark F, the sweep being from E to F. You may now divide this quadrant into six equal parts, then from B draw lines through the quadrant points so as to cut the horizontal line, G H. Then from the top, A, draw other lines cutting these points through the edges of the plate; draw a border line within the plate, and where the lines from A cut this border, there will be the places for the hour numbers, the last named lines being the hour-lines, with this addition. From where the longest quadrant line cuts the G H line at H draw another cutting through the point at A; this will be the five o'clock line, and mark it accordingly. It must be borne in mind that this right-hand part is the afternoon side of the dial and must be numbered as such, proceeding from the meridional line and marking it twelve; then going round in regular order to every hour-line, the horizontal one, that is the upper boundary of the square running through A, being the six o'clock line on that side. We next mark off the left of the line by taking the distances from the hours on the right; but, in this instance, as we are now with the forenoon we work backwards. That is, we commence at the meridian of twelve o'clock, then eleven, ten, nine, eight, seven, and six, at the hitherto unmarked end of the upper horizontal line through the point A. Having now got our hour-lines and figures all right, we rub off everything else that shows how the work was done. We strike a small circle round the point A, the hour-lines all terminating at the circular line; this gives an appearance of neatness to the work. The last thing we do is, on the point A fix an oblique style at an angle equal to the elevation of the equator that has been already spoken of. Or on C you may erect a perpendicular style equal to the radius C D. Again, you may get a triangular plate of the dimensions of the angle A, D, E, upon that part of the meridional line between A and E, standing on its edge, or, more correctly speaking, perpendicular to the plane of the dial. We have here a set of hours from six in the morning to six in the evening, and if the style is set at any of the three places indicated the shadow will touch all the hour-lines marked upon the plate.

(To be continued.)

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PRECIOUS STONES.

(Continued from page 147.)

ADULARIA.

THIS stone is so called from *Adula*, the Latin name of Mount St. Gothard, as the best kind is obtained there, and particularly from that part called the "Monte della Stella." Adularia belongs to the felspars, of which it is the purest kind. Its crystals have one of the greater diagonal. Their primitive *nodus* is an oblique prism with rhomboidal sides, whose base is an oblique-angled parallelogram; the secondary forms present an oblique prism with four facets, a large rectangular prism, a tablet with six facets, and a rectangular prism with six facets. Masses of rough adularia are found in which there frequently exist double crystals, and yet in this state of perfect union they have different degrees of hardness. Some also are opaque, others translucent or clear. This union of massed crystals causes the iridescence which often distinguishes those found in Italy, France, Germany, Norway, America, and the Isle of Ceylon. That which comes from the Monte Stella is transparent, and has whitish reflections tinted with green and blue; some pieces shine with pearly light, others are of an iridescent green colour which resembles the eye of a fish, which often, in very thin lamina, becomes by reflection a pale rose colour. This gem is remarkable for its brightness, which may compare equally with that of pearl and glass. It is very easily worked, having three cleavages, and has double refraction. Its cleavage is perfect concave. Being altogether destitute of electricity, it does not act on the magnetic needle. When exposed to the action of the blow-pipe it melts into a transparent white glass. Its specific weight is 2.5; the heat, 0.1861.

The analysis of adularia gives—

Alumina	-	-	-	-	-	-	-	20
Silex	-	-	-	-	-	-	-	64
Potash-	-	-	-	-	-	-	-	14
Lime	-	-	-	-	-	-	-	2

Although adularia scratches rock crystal, it is less hard than quartz. It is very difficult to specify its precise hardness, as the same piece contains portions which, being iridescent, are naturally soft, others, of a milky whiteness, which are harder, and, lastly, others which surpass the rock crystal in resistance. This substance, which has so many peculiarities, and is so specially prized for the pearl-white reflections which seem to move about inside the stone when it is turned, frequently owes more to the art of the lapidary for its admirable effects of light than to its natural beauty. In commerce it has a strange multiplicity of names; now it is adularia, again it is lunaria, or moonstone, sunstone, girasol, fish's eye, water opal, or opal of Ceylon, according to the colours reflected. From Siberia we have a special quality which is of a yellow colour sprinkled over all the surface with an innumerable quantity of small golden spots, produced by very small crevices in the lamina. The most beautiful, cut invariably into smooth beads, have reflections in form of a star diverging from the centre, but are very rare. It is wrong to confuse this species of adularia with the Oriental aventurino, because, although it may have the same appearance, it has not similar hardness. The adularia from Ceylon is generally in larger pieces than that from St. Gothard, but it is not so bright. The brilliancy and slightly blueish whiteness of the moonstone (lunaria) of Monte Stella are indescribable; however its value is diminished by certain oblique lines which cross it internally. It does not appear that the ancients used this felspar, nor do we believe that it can be engraved. Caire, nevertheless, asserts that Pini had a head of Achilles engraved on a moonstone by Grassi, and that it came out with extraordinary effects. He believes, however, that the ancient names of *astrios*, *lapis specularis*, and *selenites* applied to this stone.

APATITE.

This mineral was thus named by Werner, from the Greek word to deceive, on account of its deceptive colour, which resembles that of many other precious stones, whence, before its nature was precisely determined, many mineralogists were led into error. It contains 90 per cent. of subsesquiphosphate of lime, and the rest fluoride of calcium.

It is found in hexagonal crystals; its fracture is concave; it has a vitreous lustre, of a sea-green colour of blueish-green, blueish-violet; often white, and sometimes red, grey, or yellow. It is sometimes transparent and sometimes opaque.

It resembles the beryl and emerald; its specific weight is from 3 to 3.235. In some specimens, especially in the white variety, a blueish opal tint is observed in the direction of the vertical axis.

It is fragile. Some are phosphorescent in heat, others become electrical by friction. This substance does not melt under the action of the blow-pipe, excepting at its extreme edge. It dissolves slowly in nitric acid, without effervescence. On account of the phosphoric acid which it contains when solid, it is very useful as a manure. Apatite is generally found in primitive rocks traversing granite, serpent marble, and in the rocks of the spent volcanoes in Saxony, England, Switzerland, Norway, and many American countries, where there is a great trade in it as a material for enriching land.

Asparagine, which is a yellowish, translucent variety of apatite, is found in Estremadura.

ARGIRITE.

Argirite is a stone only known in modern times by the description given of it by the ancients, who also named it *argirodama* and *magnes*, and it appears that in somewhat more recent times it was called *argentina*.

Caire tells us, on the testimony of Theophrastus, that argirite, or *magnes*, was a very lustrous stone, so like silver that it might easily be mistaken for it; its texture, and the large-sized pieces in which it was found allowed of its being formed, carved, and engraved in every manner; therefore the ancients made it even into vases, and it was much prized and used in many different ways. Hill observes that the precious stone which the Greeks named *magnes* was totally different from that which to-day is generally understood under the name which we translate *magnetica*. Kirman gives the denomination of *argentina* to the schistose spar, which has a very bright pearly light. Haüy, at the word Argentina, says: see moon stone. Dutens believed that *argentina* was a resplendent girasol on a silvery white ground: but the description of *argentina* does not give us the characteristics of the girasol, which always has a little yellow inside, is semi-transparent and sometimes transparent, whereas the argirite was necessarily opaque from its similarity to silver. Caire says that by chance he became possessed of a hard stone whose appearance led him to compare it with argirite, "which was thought quite lost, and had been sought for so long." He continued: "It is formed of very thin leaves; a very bright silvery colour pervades it, without the deviating hues which are seen in cats' eyes."

I remember two objects of similar form, of unknown use and material, like cornucopias terminated by two horses' heads, which were in the Compagna Museum. They were of a whitish colour and were much oxidized, whence, at first sight, it seemed a recent precipitate of silver; but this was not so, as under the action of light they did not become darker, but always remained white.

Now, might not these two cornucopias have been formed of the unknown argirite? Mineralogists can see and examine them in the Paris Museum.

PRIZES AWARDED BY THE GOLDSMITHS' COMPANY.

THE prizes recently awarded by the Goldsmiths' Company, with a view of encouraging technical education in the design and execution of works of art in the precious metals, are as follows:—

J. Watkins, 18, Godfrey-street, King's-road, £50, for design of a centre-piece of good proportion, to be executed in gold, inlaid with ivory, and having figures representing literature, art, science, and music.

Owen Gibbons, 36, Moore-street, Chelsea, £25, for a very good design for a volunteer shield.

Thomas W. Sharp, 38, Beaufort-street, Chelsea, £25, for design for a loving cup.

A. Aitchison, 6, Muscovy-court, Trinity-square, £25, design for a presentation casket.

J. J. Shaw, 5, Muscovy-court, Trinity-square, £25, design for a casket in gold and *cloisonné* enamel.

Albert W. Austin, 89, Lilford-road, Stoke Newington, £25, for the execution of a *repoussé* figure, and ornamental work on a silver-gilt article of plate.

E. H. Stockwell, 15, Greek-street, Soho, £25, for a very good design for a presentation casket.

The annual award of prizes for the above-named object is an important and well-directed resolve of the company, and it has likewise been decided that a travelling scholarship of £100 per annum may be awarded by the wardens to a student who has shown exceptional talent, and who shall have obtained a prize for design three successive years, in order to enable him to study art in the precious metals on the continent of Europe.

ANCIENT BROOCHES AND DRESS FASTENINGS.

From "*Rambles of an Archæologist.*"

(Continued from page 131).

ALLUSION has already been made to the extreme taste for showy jewellery, and gaudy personal decoration, indulged in by the later Roman rulers, after the seat of government had been removed to Constantinople. It seems to have increased as their power decayed, for the rude paintings, and mosaics of the eighth and nine centuries depict emperors and empresses in dresses literally covered with ornament and jewellery—indeed, the artists must have put forth their best strength in depicting the dresses, as if they had received similar orders to those given by good Mrs. Primrose, who expressly desired the painter of her portrait to put as many jewels on her stomacher "as he could for the money."

Fig. 10. The bust of the Emperor Constantine Pogonatus (so



Fig. 10.

called from the ample beard the monarch wore) is an example of male foppery. This emperor came to the throne A.D. 668, and died in 685. It will be perceived the two brooches fasten his outer garment, one upon each shoulder. That upon the right one is highly enriched, but the original, as really worn by the emperor, was most probably much more so, by chasing, enamel, and jewels, which the artist had not space, or perhaps ability, to express. From it hang three chains, which were most probably formed of hollow gold beads, cast in an ornamental matrix, such having been found in Crimean graves, and less frequently in those of the Germanic and Gaulish chieftains and aristocrats. To the ends of these chains were affixed circular ornaments sometimes decorated with enamel, like the York fibulæ already described, and sometimes with cameos, set in a gold framework; for as the Arts decayed, the finer works of this kind, executed in the palmy days of Rome, were much prized and valued as the works of a race who were acknowledged to be mentally superior.

The empresses naturally wore a greater abundance of jewellery than their lords; they also wore great circular brooches on each shoulder, but they increased the pendent ornaments by adding heavy gold chains, which hung across the breast, and from the brooches on both sides nearly to the waist; at the end of these chains was a group of smaller chains, each supporting a jewel of varied form, so that a heavy bunch of them was formed. Ultimately other chains with pendent jewels were attached to the chain that passed across the breast, and completely covered that part of the person with decoration.

In the museum at Mayence is preserved a very curious monumental sculpture, upon which is presented the effigy of the man for whom it was erected, his wife, and son. He was a sailor who died at the ripe age of seventy-five, and appears to have been generous to his lady in the article of jewellery, according to the usual habit of his craft. Mr. C. Roach Smith, who first published this curious monument in his *Collectanea Antiqua*, observes that "she had evidently dressed for the portrait." She wears a vest, fitting closely to the arms and bust, and at the neck gathered to a frill, which is enclosed by a torque, or gold necklet. Over this hangs a garment which falls gracefully down in front, and is crossed at the breast over the left arm. The jewellery of the widow is of no common description, nor niggardly bestowed. Upon the breast below the torque is a rose-shaped ornament or brooch, and beneath that a couple of

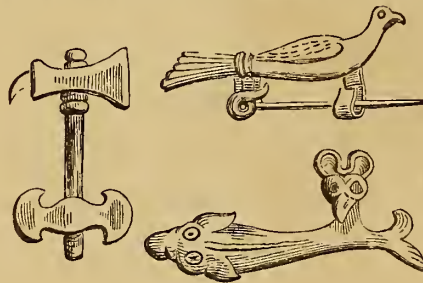
fibulæ; two more of a similar pattern fasten the upper garment near the right shoulder, and upon the left arm just above the elbow; an armlet encircles the right arm, and bracelets the wrist. Fig. 11



Fig. 11.

gives the upper portion of the form of this lady; judging from the style of her head-dress she may have lived in the reign of the Emperor Hadrian. Probably many years younger than her sailor husband, she appears to have tempered her grief with judgment, and to have taken advantage of his death to set herself forth to the world in her gayest costume.

As barbarism increased, and subverted good taste, brooches of the most absurd forms were invented, and made more grotesque by unnatural enamel colours. Birds, fish, men on horseback, formed the face of these brooches, which would never have been understood by a modern eye, had they not been found with the pins attached to



Figs. 12, 13, & 14.

them behind. Three examples from the great work of Montfaucon are given in Figs. 12, 13 and 14; they were found in Italy and Germany. The first represents a combination of two warlike implements on one handle—the upper one an axe, the lower a bipennis. The second specimen is made like a bird; we have given it at an angle, to show the way the pin was fastened on the back of it. The third specimen is a fish, which might pass for a fair representation of some member of the finny tribe, whose proper name need not be too curiously asked for; but unluckily the designer of the brooch, indulging in the grotesque, has represented some monstrous bird with bat's ears emerging from one side of the fish.

We give two specimens, one from the banks of the Rhine, the other found opposite our own shores. Fig. 15 represents a bird, probably of the hawk kind, whose eye has been made the socket for a garnet,



Fig. 15.



Fig. 16.

and the extremity of its tail a receptacle for another piece of jewellery. It was found on the site of the Roman station at Cologne.

Fig. 16, which is of plain bronze, is more fortunate as an attempt to represent a cock; it was discovered, with many other curious antiquities, at Etaples, near Boulogne, and is preserved in the museum of the latter town.

A very distinct character pervades the ornamented works of the ancient nations that once inhabited the British Isles. A curious discovery of the fibula (Fig. 17) was made at Stamford, Lincolnshire. It was found in the process of enlarging a stone pit in the parish of Castle Bytham. It is described by Mr. Akerman, in his "Pagan Saxondom," as "a ring fibula, of white metal, gilt, in very excellent preservation, and set with four gems closely resembling carbuncles. An irregular interlacing pattern is worked over the whole front surface, but it is perfectly plain behind." Mr. Akerman is inclined to think that it has a Scandinavian character, and favours the supposition that its owner was a Danish lady.

This supposition seems borne out by the researches of Dr. Davis, in his interesting ethnographical sketch of the various ancient populations who have invaded and inhabited

Anglia in pre-historic times, prefixed to that very valuable work, the "Crania Britannica." He is of opinion that about the time of Cæsar, the population of our island throughout the northern and midland counties was derived from the tribes of Jutland and North Germany, and that the Southern portions of the island were exclusively filled by the Saxon immigrants.

A fibula of very peculiar form is found in these Northern counties in great abundance. We give an example of Fig. 18; it is of bronze, and was found at Driffield, Yorkshire, in the grave of a female. Sometimes these fibulæ are richly ornamented with interlaced patterns, and heads of strange birds and animals. They are then generally gilt, and have been found of enormous size, eight inches in length by six in breadth. I imagine these very large brooches fastened the heavy outer cloak, the smaller being used for lighter portions of the dress.

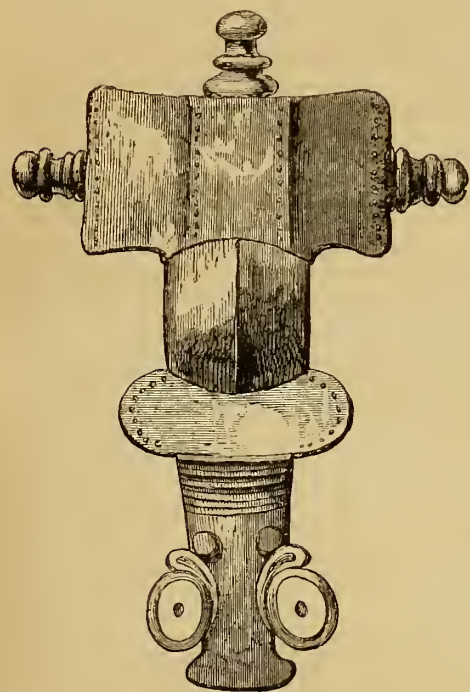


FIG. 18.

Fig. 19 and 20: Two smaller bronze fibulæ, one with a simple, curved headplate and the other with a more complex, interlaced design.

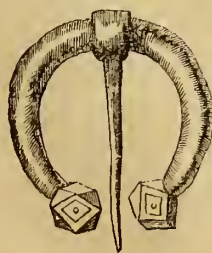


FIG. 19.

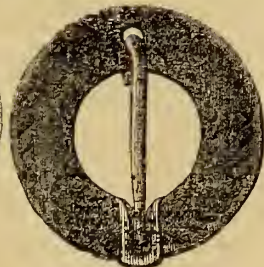


FIG. 20.

The ordinary form of brooch worn by the humbler classes is shown in the two specimens, Figs. 19 and 20; both are of bronze,

with very slight attempt at ornament, and were found by labourers employed in repairing the road on the line of the Watling Street, about a mile from the Roman British settlement, at Cesterover, between Bensford Bridge and the road leading from Rugby to Lutterworth.

Two specimens of the circular fibulæ of the Southern Anglo-Saxons are given in Figs. 21 and 22. They were both found in Kent, where the wealthiest and most refined Saxons were located.

It is curious to note how completely in design and execution they resemble such as are found in South Germany. In the Augsburg Museum are some identical in design and execution with Kentish specimens in the Mayor Museum at Liverpool. They appear as if made by the same workmen.

These fibulæ are generally much-enriched on the upper-surface. A soft enamel, or slices of pearl (which have generally perished), probably filled the outer rim in Fig. 21; the centre is here raised,

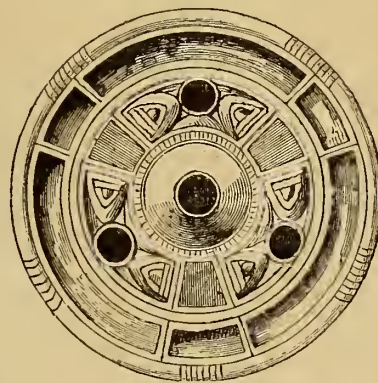


FIG. 21.

and is formed of pearl, in the centre of which is a garnet, and slices of garnet are cut to fit the triangular ornaments; to give them greater brilliancy, they are laid on a thin piece of gold foil. Fig. 22 is of more elaborate design; the use of garnet is again apparent, but the spaces between the jewellery are filled with a

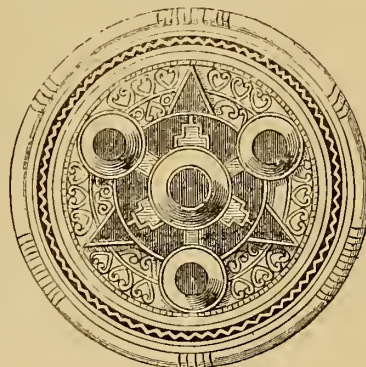


FIG. 22.

double row of incurved ornaments, made of fine threads of gold; sometimes the threads of gold are reeded or plaited, of two or three finer gold threads. I have been assured by practical goldsmiths that more delicate work could not be done in the present day. All those small ornaments are made singly, and then fastened in their places. They excite astonishment at the great refinement that must have characterized the Anglo-Saxons, and which is carried out in other articles found in their tumuli.

(To be continued.)

WHERE.—Where is the railway passenger who, when he leaves the train, is so uncommonly polite as to shut the door after him? Where is the public orator who can ever keep his promise to say "a few words only?" Where is the organ fiend who will move off from your door without your fetching a policeman? Where is the builder who never lets his bill exceed his given estimate? Where is the barber who can manage to content himself by cutting your hair simply, without making any cutting observations on its scantiness? And lastly, where is the young lady who can pack her own boxes, and not leave half her "things" behind her?

THE QUEEN'S NECKLACE.

(Continued from page 150).

THE jewellers of the Crown, Böhmer and Bassange, had collected the finest diamonds that could be obtained for love or money, and had made them into a necklace of rare beauty. This necklace, it is said, was worth not less than 1,800,000 francs. Intended at first for Madame du Barry, the makers hoped they might be able to sell it to the Queen. In 1778, during the American war, Böhmer showed the *parure* to Louis XVI., who was so pleased with it that he wished the Queen to have it, costly as it was. But Marie Antoinette declined to increase the financial embarrassments of the State by indulging her fancy. "We have more need," she said, "of a vessel than a bijou." Several times Böhmer tried to induce her majesty to purchase the necklace, but in vain. After peace was signed in 1785 he renewed his attempt at Versailles, but not daring to offer it himself to the Queen, having been so frequently refused, he sought some one who could introduce the subject to her majesty. A person named Achet suggested to him, as one capable of performing that service, the Comtesse de Lamotte, a lady of the House of Valois, and reputed to be in high favour with the Queen. Madame de Lamotte, who accounted for her sudden wealth by her influence at court, soon entered into an arrangement with Achet. At the first interview on the subject, however, she pretended to be undecided. She knew not whether it were possible to take the step proposed, but she was curious to see this magnificent *parure*. Bassange took the necklace to her house: when she told him that she should like to be of use to him, but that "she was reluctant to mix herself up in this sort of thing," she neither refused nor promised: "perhaps she would find a favourable opportunity." Three weeks passed; then, on a fresh application from Achet, she requested the jewellers to come to her. At this second interview she told them she hoped they would succeed in selling the necklace within a few days, since a *grand seigneur* would be authorized to treat for it. Three days afterwards, the 24th January, 1785, she presented herself at the jewellers' with her husband at seven o'clock in the morning, and announced that the person charged with the negotiation would shortly visit them: she added, however, that it was not necessary to mention her name to this person, her only motive in this negotiation being the pleasure of obliging them. M. and Madame de Lamotte then withdrew, and a quarter of an hour afterwards the Cardinal appeared. After having examined the necklace and inquired the price, which the jewellers fixed at 1,600,000 francs, he told them that "he was authorized to purchase it, that it was not for himself, and that he did not know whether he was at liberty to reveal the name of the purchaser; but should he, however, not be able to do so, he would make some private arrangement." On the 29th of January he sent for Böhmer and Bassange to his hotel, and informed them that he was authorized to treat for the necklace, but under the express command of secrecy; at the same time making the following propositions: "The value of the necklace should be fixed by MM. Doigny and Malliard should the price (1,600,000 francs) at which they wished to sell it be thought too great; the payment was to begin at the end of six months, when 400,000 francs would be handed over to them, a similar sum to be paid every six months until the whole was liquidated. If these conditions were agreeable, the necklace was to be ready by the 1st of February, at latest."

The jewellers accepted these terms and signed the agreement.

Madame de Lamotte, who had taken care that her name should not be mentioned in the affair, had thus lost no time. On the 29th of January, the prince concluded the negotiations; on the 31st Madame de Lamotte brought to him the Queen's ratification; and the next day he wrote to the jewellers to bring the necklace as soon as possible. Böhmer and Bassange obeyed orders. The prince then informed them that it was the Queen who had purchased it, and showed them the terms they had accepted signed *Marie Antoinette de France*. The jewellers knew neither the writing nor the signature of her majesty, since she was accustomed to give her orders *viva voce*, or to communicate them by one of her ladies-in-waiting. The prince told them he could not leave the paper with them, but showed a letter from the Queen containing these words: "I am not accustomed to treat in this way with my jewellers; you will keep the paper by you and arrange the rest as you think proper." The Cardinal assured them, moreover, that he would deliver the necklace that very day, and in the afternoon wrote the following letter:—

"MONS. BÖHMER,—Her Majesty the Queen has informed me that the interest, which shall be due after the first payment, should be paid suc-

cursively with the capital until the whole debt is discharged.—Signed, Cardinal Prince de Rohan. Paris, 1st February, 1785."

The same evening the prince went to Versailles, accompanied by his confidential valet, who carried the casket. Arrived there, he proceeded to Madame de Lamotte's, and at the door took the casket from the hand of his valet, sent him away, and ascended the staircase. Madame de Lamotte was alone in a dim half-lighted apartment. Soon afterwards a door opened, and a voice cried, "From the Queen;" the Cardinal then retired to a recess. A man appeared, who delivered a note to Madame de Lamotte. Who was that man? The cardinal believed he recognized in him a person attached to the Queen's chamber, and that he had already seen him in the park of Versailles on the evening of the scene in the Bosquet de Vénus. Madame de Lamotte, having read to the Cardinal this note, which ordered him to give the casket to the bearer, took it from his hands, and delivered the precious box to the messenger. It was Rétaux de Villette, who immediately disappeared.

From this moment the two Lamottes had their hands full of diamonds. They paid a watchmaker for a time-piece with a couple, worth 2700 francs. They sold or pledged at Paris jewelry to the extent of 3600 francs, and at Regnier of 8500 francs. On the 15th of February Villette offered three packets of diamonds, valued at about 20,000 francs. The party to whom they were offered, suspecting him of robbery, denounced him to the police. Summoned before the Commissary of police at the Châtelet, Villette declared, not without hesitation, that he received the precious stones from Madame de Lamotte-Valois, who had instructed him to sell them. An inquiry was made at the Bureau de Sureté whether any information had been given respecting a robbery of diamonds, and as no complaint had been made, Villette was set at liberty. This circumstance opened the eyes of the Lamottes to the danger of converting the *débris* of the necklace into money in France; so in the month of April, Mons. de Lamotte crossed over into England, where he sold not only some stones detached from the necklace, but more important pieces of the *parure*.

Whilst the necklace was thus being scattered about the world, the Prince de Rohan believed it to be in the hands of the Queen. He saw Böhmer and Bassange during the early part of February, and begged them to take the first opportunity they might have of approaching the Queen, to thank her. He thus remained to the month of June in the blindest security. From the fate of the necklace he was, moreover, greatly distracted by the success of Cagliostro, who had just arrived in Paris. It was the age of miracles, of enthusiasm, of the foundation of the Egyptian Lodge; and the prince lived in a dream between Cagliostro and Madame de Lamotte, between the marvels of alchemy and the correspondence of the Queen, doubly duped, doubly deluded. He went three or four times a week to sup at the hôtel of the Rue St. Claude with his friends, Saint-James and the Baron de Planta. Madame de Lamotte, who affected a profound respect for a man of supernatural powers, was sometimes admitted to these réünions. She there enchanted every one with her wit; Cagliostro displayed his most ingenious machines; and Mons. de Rohan was as happy as he could be in this *petite société*, where too many brilliant men of honour shone for him not to be infinitely amused.

In the mean while the prince awaited with impatience the time so often alluded to in the letters, when he should be received once more into the royal favour. His presence in Paris, and his visits to Versailles, disquieted Madame de Lamotte. Might he not, wearied by these perpetual delays, attempt to gain an audience of the Queen of his own accord? She perceived the danger, and persuaded him that his absence was necessary whilst they were completing the work of his elevation. He therefore left for Saverne about the beginning of May. On his return, in the middle of June, the Cardinal expressed to Madame de Lamotte his astonishment that the Queen had not worn the necklace, either at Versailles on Whit-Monday, or at the *fêtes* which had just taken place at Paris in celebration of the baptism of the Duc d'Angoulême. Pressed by his questions, Madame de Lamotte told him that, since he would know the real motive, the Queen thought the price of the necklace excessive, and that she required a reduction of 200,000 francs, or, according to the terms of the agreement, a valuation; if not, it would be returned. The prince, full of faith, negotiated this little affair with the jewellers, who accepted, not without reluctance, the reduction; stipulating, however, that when the first payment became due they should receive 700,000 francs instead of 400,000. Early in July the Cardinal saw the jewellers, pressed them again to thank the Queen, and dictated the following letter for them:—

"MADAME,—We are exceedingly gratified to believe that the last arrangements which were proposed to us, and to which we assented with zeal and

respect, are a new proof of our submission and devotion to the orders of your majesty; and we have a real satisfaction in thinking that the most beautiful *parure* of diamonds which exists will grace the greatest and the best of queens."

This letter was delivered to Marie Antoinette on the 12th of July. At the moment Böhmer presented it, the Comptroller-General entered, so that the jeweller went away without an answer. When, shortly afterwards, the Queen sent for him to demand the meaning of this mysterious epistle, he had left Versailles. "The Queen," says Madame Campan in her Memoirs, "entered the library. She held the paper in her hand. She read it to me, saying that as I had guessed that morning the conundrums of the *Mercury*, perhaps I could discover the meaning of that which the stupid Böhmer had just given her. As soon as she had finished reading, she crumpled up the paper, and burnt it at a taper which remained lighted in the library for the purpose of sealing letters, and said, 'It is not worth keeping.' She commanded me, when I saw Böhmer, to ask for an explanation."

Thus this letter—unintelligible, it is true, to any one not in the secret of the intrigue—revealed nothing to Marie Antoinette; and on the other hand, the silence of the Queen after the 12th of July served to confirm the prince and the jewellers in the belief that she had the necklace. Thus everything turned out favourable for Madame de Lamotte; and this letter, which might have destroyed her, gave her time to put the finishing touch to her fraud, and consummate it with impunity.

The day of payment arrived. Madame de Lamotte went to the prince, and showed him a short note, in which the Queen was made to say that "she had disposed of the 700,000 francs set aside for the jewellers and that she could not pay them until the 1st of October; but that the interest should be ready." The surprise and perplexity of the Cardinal at this intelligence can easily be imagined. He now heard, too, that a lady-in-waiting on the Queen (Madame Campan) had declared, some days after the receipt of the letter, that her majesty didn't know what it meant. The jewellers too informed him that the minister of the king's household (Baron de Breteuil) had sent for them. He then found the writing of the Queen. It struck him also to compare the writing on the margin of the agreement, and was immediately astounded at the difference of the letters. The most terrible suspicions now crossed his mind. He sent for Madame de Lamotte, and looking at her fixedly, said, "You have cruelly deceived me;" and reproached her bitterly. Madame, however, soon appeased his anger and allayed his suspicions by bringing to him, in the name of the Queen, 30,000 francs—the interest to be paid on the 1st of August. The prince could not of course imagine, justly observes Carpeyron, that this woman, whom he believed to be in want,—to whom he sent every now and then four or five louis,—had on the 27th of July borrowed these 30,000 francs from a notary, giving as security some diamonds from the necklace. She hoped, moreover, to dupe the jewellers as well as the prince; to make them accept this fresh delay as they had already accepted the reduction of price, and by means of these 30,000 francs to purchase their silence until October. This time, however, they would not enter into her views. They took the money, not as interest, but on account; and, refusing to wait any longer, declared they would go at once to the Queen, and take steps to obtain payment of the promised capital. This resolution, which rendered discovery of the fraud inevitable and immediate, determined Madame de Lamotte to force on the *dénouement*.

On the 3rd of August she sent for Bassange. On his arrival, she asked him whether he had seen the Cardinal recently, and whether he had communicated anything fresh. On receiving an answer in the negative, "The prince," she said, "is in the greatest perplexity. The agreement, which was signed apparently by her Majesty the Queen, is a forged signature. How is he to escape from his embarrassment? I don't know. At all events, take your precautions with respect to him; he has a considerable fortune, and is well able to pay you." When she saw Bassange stunned, as it were, by this disclosure, she endeavoured to assure him "that the Cardinal was a very wealthy nobleman; that they must get him into their hands, and insist absolutely that he should engage to reimburse them. She added that the misfortune of the prince had arisen from the writing which he had given them to deliver to the Queen; and that if the Cardinal had consulted her, she would have insisted on nothing being done, being persuaded that the Queen would be sure to be offended." Thus this artful woman urged the jewellers at the *dénouement* of the affair, as she had at the beginning, to secure themselves with regard to the Cardinal, and to bind him so that he could not escape. It was a bold but sovereignly-clever manoeuvre, it must be confessed, thus to open the eyes of the jewellers. Would it not, however, have been better to tell the truth, since in a few

days it must be detected? Would it not have been better to have enlightened the jewellers, and by them the Cardinal, to let him see the net in which he had entangled himself, and therefore to impose upon him the necessity of treating at any price with Böhmer and Bassange? Was it not the only way to stop the proceedings of those at court, and to bury the fraud in a silence which all had an interest in keeping?

Madame de Lamotte calculated wrongly; and in his examination the Cardinal declared, "that certainly he would have preferred to pay, and leave Madame de Lamotte to enjoy the fruit of her intrigues, had nothing been said about the affair."

The conduct of Böhmer, however, defeated madame's new scheme. The same day he had an interview with Madame Campan, who perceived that Böhmer was the victim of a swindle, and that the name of the Queen had been mixed up in a fraud of the most dangerous and audacious character. Next morning Bassange went early to the Cardinal's; but instead of using clear and unequivocal language,—instead of speaking plainly to him of the interview he had had with Madame de Lamotte,—instead of telling him distinctly that the pretended signature of the Queen was a forgery,—"he begged pardon beforehand for the question he was about to put, and which might appear somewhat indiscreet."

"Monseigneur," he said, "I wish to know if you are quite certain of the intermediary person you have employed in the negotiation about the necklace with the Queen. I put this question because you have informed me on several occasions that there was an intermediary person engaged in this negotiation."

The Cardinal hesitated to reply, appeared thoughtful, and ended by saying:—

"If I hesitate to answer you, it is not because my reply is not quite ready; I only reflected whether I ought to tell you all." And then he added, as if on second thoughts, "I ought and will. If, after this, I should tell you I have treated directly with the Queen, would you be satisfied?"

"Yes, Monseigneur," replied Bassange.

"Well, then, I assure you I have treated directly with her majesty. Do not," he added, "mention this conversation; for I would contradict you, and deny it *in toto*. You need not be anxious; go and allay the apprehensions of your partner."

Obviously by speaking in this way the Cardinal deceived Bassange with the intention of removing all anxiety from his mind, and preventing a fatal termination should the affair be noised abroad. Are we to suppose that from this moment he knew the whole truth, and was certain he had been duped by Madame de Lamotte? Nothing proves it. His conduct during these last days seems to indicate, on the contrary, that he was not disabused until the moment of his arrest, or perhaps even later, as he himself maintains, when immured in the Bastille, and then only by the confessions of Villette and Oliva.

Scarcely had Bassange left the Hôtel de Strasbourg, when a messenger arrived from Madame de Lamotte, informing the Cardinal that she was detained at home, and begging him to come and see her. He went, and found her in despair, the tears streaming from her eyes. She told him that she could no longer disguise the fact; that the goodness with which the Queen had honoured her had created many enemies; that she had not sufficient strength to face calumny; and that she thought it best to pass some time in the country. She was so troubled, however, that she entreated, as a favour, that he would give her an asylum in his house. According to the Abbé Georgel, Madame Lamotte, determined to drive the prince to extremities, did not stop at this vague falsehood. "I have just come from the Queen," she added; "I described to her the distress of Böhmer, the impossibility of your satisfying him, and the scandal that must ensue. Then her majesty, forgetting her former kindness, declared she would deny having the necklace from me, that she would deny the authorization, and that she would take steps to have me arrested, and would ruin you."

(To be continued.)

WHEELER'S ILLUSTRATED CATALOGUE OF CLOCKS, WATCHES, AND JEWELLERY.—We are in receipt of this excellent pamphlet, published by Mr. Thomas Wheeler, of Preston, and find it well worthy of perusal. It contains many useful particulars relating to the nature of the construction of a watch, besides patterns of various articles of jewellery, and will be found very useful to shop-keepers and others.

WE should never remember the benefits we have conferred, nor forget the favours received.

THE CLOCKMAKERS OF THE SCHWARZWALD.

(From the New York "Jewellers' Circular.")

THE Baden State Railway, running in an unbroken line from the Rhine plain at Mannheim to the shores of the Bodeusee at Constance, forms two sides of that part of the Grand Duchy of Baden which in Germany is called Badischer Schwarzwald. Along this line go great numbers of English tourists hurrying to Switzerland and rushing back again to England, but they seldom set foot in any part of this district except in the town of Freiburg, a pleasant point to break a long and somewhat tedious journey. The dark hills thickly covered with pine trees, which the traveller sees from the windows of his carriage, generally serve to remind him of the grander mountain he has left or of the peaks which he hopes to climb. But among these hills is much picturesque and quaint scenery, of a character at once unique and distinct from that of countries more frequented by the traveller. From any high ground lofty hills can be seen extending towards the horizon, more or less clothed with black pine forests, broken here and there by the lighter foliage in the valleys, or by the open patches of cultivated land. There are cottage farms, with huge black and spreading roofs, better built, and showing signs of greater prosperity and comfort than in most mountainous districts. The village houses are less thickly grouped, and everything indicates an active and industrious people. In the valleys are many charming landscapes; the scale is small, but the perfect union of water and rock, of wood and meadow produces harmonious and delightful pictures. Among the thick and fragrant woods the scenes are different, more weird and wild, but none the less attractive. Among these woods and hills dwell a people who unite the simplicity and kindness of the mountaineer and agriculturist with the shrewdness and energy of the artisan of the town. They cultivate their land with surprising care, and work at the manufacture of clocks and watches, glass and straw articles, with a diligence which has been rewarded by great success. They are so energetic and desirous of doing well in life, that, like the men of the Canton Graubunden and the Oetzthal Alps, they willingly leave their own country and go away to England, America, or France, where they work hard, chiefly at clocks and watches. But to this desire for bettering their condition is united a strong love of home, so that in three or four years they come back with sufficient money to buy themselves a piece of land, on which for the rest of their days they live; they settle down, and their children will do as they have done.

The first thing which a stranger does at Furtwangen is to see the exhibition of the Gewerbevereins, and at Tryberg the Gewerbe Hall, open from May to October. The latter is a wooden building of some taste, where every variety of clock can be seen which the ingenuity of the Schwarzwalders can devise or his fingers execute. Round the walls and on the tables are clocks of every sort. Nearly all are of wood, though here and there is a fragile one of straw or ivory. The first which attracts attention is a very fine specimen of wood carving; the figures and design are cut in line wood, and it stands two feet high. The fingers and hours are of ivory. The attendant puts it to two o'clock, and it forthwith plays a melodious air, as of the most delicate flutes. The next is still larger, and as the hour strikes a miniature band plays "*Der Wacht am Rhein*." We pass on to one made of beech and walnut, the dark and light wood being charmingly blended. As the fingers touch the hour, two helmeted trumpeters step out and blow the reveille. Then there are cuckoos which strike up at the hour and thrushes who sing at the quarter, venerable monks standing beneath the belfry ring the hour when midnight comes. The automaton clock comes next, and we watch a sort of Piekwiekian fat boy feed himself with rolls till three has finished striking. The taste and minuteness of the carving in the largest or the smallest point are very great; the regulator on the pendulum of the smallest clock represents, perhaps, an oak leaf, or some simple but still graceful object. Nor are more methodical and stronger-looking clocks wanting; they are of every kind; they will suit the kitchen or the boudoir. The excellence of the external work is equalled by that of the machinery, for, having once gained a reputation, the inhabitants of these hills take care that it shall not be lost. The Gewerbeverein, or Union, guarantee the goodness of each clock which hangs on the walls.

Thirty years ago a really good little clock could have been bought for sixpence or eightpence, but now, with communication more easy, the small ones are sold for four or five shillings, the cheapest trumpet for six pounds. Every workman has his special piece of work; one carves the figures, another prepares the dial, a third the wheels, a fourth the pendulum, so that on one clock many hands are employed. Under this system, within a radius of sixty

English miles, the number of clocks or watches turned out annually is nearly 700,000. Figures convey but small impressions to the mind, but if it is remembered that 5000 men are working at this trade, and that there are only about 2500 inhabitants in Furtwangen and 1500 in Tryberg, it will be seen how strong a hold this trade has upon the people of the Schwarzwald.

It chanced that towards the end of the seventeenth century a family named Kreuz, more enterprising or clever than their neighbours, lived in the village of Nenkirch. They made a rude clock, works and frame of wood, with a weight, and this was given or sold to the parish priest. This idea was not lost upon others of the enterprising Schwarzwalders, and the example was soon followed and not long afterwards the farmhouses of the district began to be adorned with wooden clocks. Two men were very apt at the work, they may also be called the fathers of the art; their names were Lorenz Frei, called "the Woodworker," and Solomon Henniger, of St. Margen. The germs now rapidly developed; the simple carving of wooden stands or frames gave place to the more elaborate work of ornamental clockmaking; the wood, the want of other occupations, the uncommon industry, acuteness, and union of the people, the freedom from political and other disturbing causes all promoted this quick growth. Hawkers sold the clocks throughout Germany, and the Schwarzwald soon became celebrated throughout the empire.

The clocks were at first very simple in construction, wooden wheels and carved frames. It was not until between the years 1730 and 1740 that the first cuckoo clock—which is one of the class called *Spieuhren*, or clocks of amusement—was introduced by Franz Ketterer, of Schonwald, a small hamlet on the hill above Tryberg, who is the real originator of the description of clock for which the Black Forest is most noted. This was novel enough for a time, but more minds set to work, and forty years later Anthony Duffner devised the first flute clock. Soon a real, noteworthy advance took place, in the introduction of the first pendulum clock. Then the fancy of one, Kirner, a Schwarzwalders, who had become court painter to the King of Bavaria, suggested that very pleasant instrument, the trumpet clock. There were now five hundred persons engaged in the clock trade in the Black Forest, and it had become the recognized occupation of the people. The work was all done by hand; not for some years was machinery used. But instead of the primitive fashion of each family working for themselves, masters and workmen began to appear; and as time went on, the change became more and more complete, till, in 1849, the Grand Duke Leopold was asked to assist in founding a clock and watchmaker's school. The government of Baden at once acceded, and they gave ten thousand florins for the purpose of defraying some of the building expenses and to carry on the work of the institution—the community of Furtwangen gave wood and materials—and in 1850 the Clockmaker's School at Furtwangen was opened. Thus almost before the workmen of England had begun to think of technical schools, the peasants of a distant German province had already set one on foot. It has given new impetus to the work, and by the introduction of a special literature and instruction in no small degree aided the general education of the people of this and the neighbouring villages, as well as the actual technical branch which it was created to improve. The school has two main objects. Firstly, the education of the young by literary and theoretical teaching in the elements on which the art of clockmaking is composed, that is, in the general principles common to any scientific manufacture, and in the more intricate details belonging specially to this one branch. Secondly, the improvement of the trade by a practical school or workshop, where the theories already taught can be carried out, where new improvements and methods can be tried, and where practical instruction can be given. Two important principles are acted upon in carrying out these aims,—the instruction is free, and it is not in the place of, but subsidiary to, and based on, that which is given in the *Folksschule*, or public elementary schools. This is important to notice, because there is too great a tendency in England to begin at the wrong end, not only in the lower branches of technical instruction but also in those of a higher and more intellectual grade, and make technical supply the place of general teaching. Briefly put, these are some of the details connected with the school:—The age of admittance is fourteen, and the pupil must have passed through the *Folksschule*; a yearly examination, yearly distribution of prizes; a library containing technical and scientific books and models, and a period of study not confined to any particular time or length. The subjects taught are: (a) freehand and ornamental drawing; (b) arithmetic, geometry, and lineal drawing; (c) constructive drawing; (d) mechanics and natural science; (e) heads of German industry and mercantile business; (f) French, when possible,

There are a few minutiae to notice as to the workshop. The most important are that the workers must bring their own tools, unless they can show satisfactorily that they are too poor to afford them, when they will obtain them freely at the shop. The government defrays the expense of living at Furtwangen of those also who would be unable to attend out of their own means. There are saw-mills and other appliances for doing the rougher work, preparatory to the more delicate details of the instructive workshop. Lastly, the whole is under the supervision of the government, through the minister of industry. The school and shop have both succeeded well, the trade increases every year, the prosperity of the people in an equal degree. As railways are extended, and the means of communication, not only with the immediate parts of Germany, but with the more distant countries of Europe and the world, become more easy, so undoubtedly will be seen a further extension of the business of the Schwarzwald.

It will be seen from these brief sketches that the wanderer in the Black Forest can not only receive pleasure from the charms of a peculiar and beautiful scenery,—he has also opportunities of studying some social features hardly to be found in more populous places. He finds—a long way from the great centres of commerce and manufactures—a simple and kind-hearted people, carrying on an ingenious trade quietly, yet actively, and keeping pace with modern improvements, for the peacefulness of the pine woods and the patriarchal simplicity of the villagers' lives seem to enable them to labour without the disturbing influences at work among so many industrial communities.

AN IMPORTANT INVENTION FOR MANUFACTURING JEWELLERS AND OTHERS.

THE NEW "CELLINI" KALEIDOSCOPE.

THE above-named instrument just introduced, and manufactured by the London Stereoscopic & Photographic Company, is one of such merit and importance to manufacturers, that it merits a far more detailed description than the pressure on our pages will admit of insertion in the present number, for which reason, we can but briefly notice its introduction, and hope to enter into a more complete account of its various advantages in our next. Suffice it, however, for us to remark that the powers of the instrument are such as to render it of great value to designers in all branches, especially manufacturing jewellers, who will doubtless welcome its introduction as a highly useful aid in their business. We are informed that the demand is already greatly in excess of the possibility of the supply, and as the matter is of such importance to the various trades represented in our pages, we shall endeavour to place all the particulars before their notice in our next number, and, if possible, to give sketches or illustrations of designs produced by the instrument.

THE SICKER SAFE AND STRONG-ROOM COMPANY, LIMITED.

AT a meeting of the board, held on the 21st ult., at the offices, 89, Snow-hill, an interim dividend of 10% per cent. per annum, for the half-year ending November 30, was declared payable on the 15th January next. It was also resolved that, "in anticipation of the company taking possession of the new works at Soho, and the consequent extended operations of their business, the remainder of the 65,000 shares offered in the original prospectus be issued at par, and that preference in allotment be given to existing shareholders."

COMPETITIVE WATCH TRIALS AT GENEVA.

THE Society of Arts of Geneva, in celebration of its centenary, proposes to have an international competitive trial of pocket chronometers and fine watches, to be conducted at the Geneva Observatory under the superintendence of the Director, Professor Plantamour. All timekeepers for competition must be delivered at the Observatory before noon of the 14th February, 1876, and must be accompanied by a certificate bearing the number of the watch or chronometer, the name of the maker, the name of the timer, a description of the escapement and of the balance-spring, and any other details of construction—independent seconds, chronograph, fusee, &c.—*Horological Journal*.

THE ECONOMIC MICROSCOPE.

AMONG the many recent and valuable additions to scientific instruments we notice the Economic Microscope, designed and manufactured by Messrs. R. & J. Beck, of Cornhill, and which combines the advantages of high-class workmanship, with portability, utility, and convenience. As the microscope is now such an absolute necessity for the student, to enable him satisfactorily to carry on his investigations, it is more than ever incumbent on the optician to construct a sound, economic instrument adapted to the special requirements of this large and increasing class.

Of late years, professors of our colleges have recommended students to purchase foreign microscopes, as being sufficiently good for their necessities, as well as less costly in price. The instrument to which we herein allude is, however, not only more convenient in arrangement, but can likewise be purchased at a much lower price than those imported from foreign makers; and although originally manufactured to meet the urgent requirements of students, this excellent instrument is likewise admirably adapted for the use of amateurs, and those who desire to assist beginners.

In order to convey a clear idea of the instrument alluded to, we herewith show a drawing thereof.

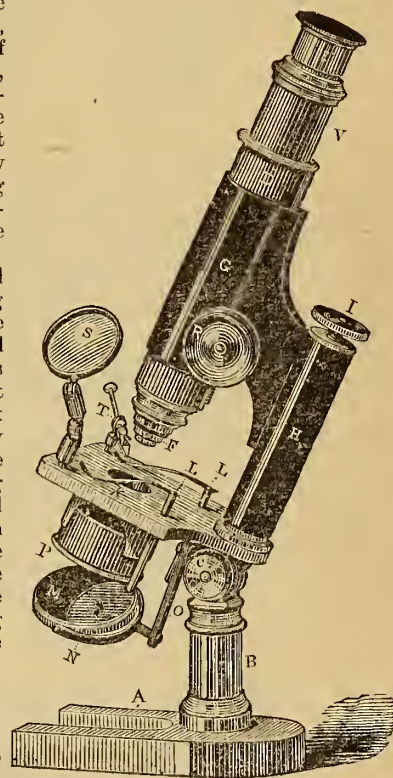
The foundation of the stand is a heavy horse-shoe, base A, at the bend of which is a firm pillar B, having at its top a hinge-joint C, which allows the body D to be inclined at any angle, and is sufficiently firm to permit of its being placed in a horizontal position for use with the camera lucida.

The body is supplied with a draw or lengthening tube, V, which must be pulled out to give the full power to the object-glass F. The coarse adjustment R is produced by a rack and pinion conveniently placed, which moves the body-tube D, carrying the object-glass F and eye-piece E up and down with great precision. The slow motion is given by the tube H sliding over the inner stem with a spring inside, and adjusted by the milled head I.

The instrument is supplied with two eye-pieces, and two object-glasses, a one-inch, magnifying 45 to 110 diameters, and a quarter-inch from 155 to 330 diameters.

The stage K upon which the object is placed has two springs, L L, the pins attached to which may be inserted in any of the four holes on the stage, and by their pressure (which can be varied by pushing them more or less down) they will hold the object under them, or allow it to be moved about with the greatest accuracy. The mirror M, besides swinging in the rotating semicircle, N, is attached to a bar, O, with a joint at each end allowing a lateral movement, so as to throw oblique light on the object, and for this purpose (the diaphragm P having been moved) the tube into which it slides has a semicircular piece cut out on either side. The diaphragm P slides in the sub-stage fitting, and consists of a tube containing two small stops or holes. The instrument is also supplied with a side condensing lens, S, for the observation of opaque objects fitting into any of the holes on the stage K, and supplied with a universal joint for placing it in any position.

A pair of forceps, T, for holding a minute object, also fitting into the holes on the stage K. A pair of brass pliers for use in water. A glass plate with a ledge, specially intended for the examination of fluids, and a few pieces of thin glass for covering the object under observation. The instrument fits into a neat mahogany case, with lock and key, and from its many advantages and highly useful combinations will doubtless have a very great sale, the more so as its practical merits become generally known.



FINGER RINGS.

(Continued from page 153.)

MEDIEVAL RINGS.

THE rings worn by the higher class of our Anglo-Saxon ancestors during the Heptarchy were often very beautiful and of imposing form. One of the finest we have seen belonged to the Rev. H. B. Hutchings, of Appleshaw, Hants, and was found in a meadow at Bossington, near Stockbridge, in the same county, by a labourer, who saw it among a heap of peat. We give a side and front view of this interesting relic; the whole is of gold, and is of



FIG. 38.

FIG. 39.

considerable weight and thickness; the gold threads are all beautifully reeded, and the lettering and head executed with great care. The inscription reads—"NOMEN EHLLA FID IN XPO," equivalent to its owner saying, "My name is Ella, my faith is in Christ."

The beautiful and remarkable collection of rings formed by Edmund Waterton, Esq., F.S.A., to which allusion has already been made, includes a ring of South Saxon workmanship which was found in the Thames at Chelsea in 1856. The face of this ring (Fig. 40) is an elongated oval, with a circular centre. Within this circle is the conventional figure of a dragon, surrounded by convoluted ornament, reminding us forcibly of the prevailing enrichments so lavishly bestowed on old Runic monuments at home and abroad. Four quaintly-formed heads of dragons occupy the triangular spaces above and below this centre. This ring is of silver. The ground between the ornament has been cut down, probably for the insertion of niello or enamel colours.

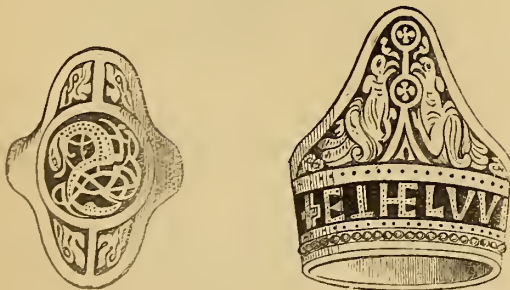


FIG. 40.

FIG. 41.

Fig. 41 is an historic relic of singular interest, and a remarkable work of early art. It is the ring of Ethelwulf, King of Wessex (the father of Alfred the Great), who reigned A.D. 836-838, and bears the royal name upon it. It was found in the parish of Laverstock, Hants, in a cart-rut, where it had become much crushed and defaced. The form is remarkable, the front rising pyramidally. Two birds of conventional form face each other, a flower ornament dividing them. These decorations, like those on Mr. Waterton's ring, just described, are relieved by a ground of glossy blueish-black enamel, cavities having been cut between the ornament for its infusion. This ring is of gold, weighing 11 dwts. 14 grs.; it is now preserved in the British Museum.

Mr. Waterton is the fortunate possessor of a ring second only in interest and value to his royal relic. It is the ring of Ahlstan, Bishop of Sherborne, the friend and counsellor of King Ethelwulf, who flourished A.D. 817-867. It was discovered in Carnarvonshire and has the name of the bishop in divided letters distributed on the circular

rosettes of the design; they are connected by lozenge-shaped floriated ornaments, having dragons in their centres. Our cut (Fig. 42) gives the general form and detail of this beautiful ring, which is remarkable for the elegance of its design. It is of gold, like the preceding

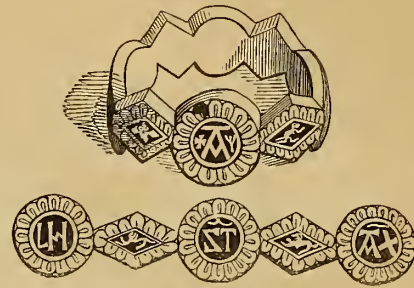


FIG. 42.

ring, both being admirable illustrations of the *champ-levé* process of enamelling practised in the ninth century.

A remarkable discovery of coins and treasure was made in 1840 by workmen employed in digging at Cuerdale, near Preston, in Lancashire. It consisted of a large mass of silver in the form of ingots or bars of various sizes, a few armlets and rings, and portions of other ornaments cut into pieces as if for remelting. With them were packed nearly 7000 coins of various descriptions, consisting of Anglo-Saxon pennies, others struck by the second race of French kings, a few Oriental coins, and others which appear to have been coined by some of the piratical northern chieftains. This treasure was minutely examined by E. Hawkins, F.R.S., of the British Museum, and he came to the conclusion that it had been deposited about the year 910, and that the ornaments must be considered such as were worn about the time of Alfred, or perhaps somewhat earlier. The rings retain much of the primitive British form, as will be seen on examining the two selected for engraving here. Fig. 43 is beaten out into a broad face, which is covered with an indented



FIG. 43.



FIG. 44.

ornament produced by a chisel-shaped punch of triangular form, the points of two conjoined in one pattern; the edge of the ring on each side is further enriched by a series of dots. Fig. 44 has a still broader face, which is decorated by groups of three circles each, somewhat irregularly distributed over the surface, with indented lines between them. The open end of this ring has been drawn together and secured by a coil of wire. Such rings were probably worn by the middle classes.

The passion for gems and jewellery was expressive among all the Gothic nations. When Alaric pillaged Rome his booty in this way was enormous, and it was recorded that his princess, Placidia, received, as a present from the conqueror's brother, fifty basins filled with precious stones of inestimable value. Not only were the persons of these sovereigns and nobles covered with gems, inserted in girdles, sword-scabbards, on borders of garments or shoes, but vases, dishes, bowls, drinking-cups, as well as portable articles of furniture, caskets, &c., were similarly enriched. The Ostrogoth and Visigoth kings amassed, in Tolosa and Narbonne, immense treasures in gems and gold and silver vessels. When Narbonne was pillaged the number of ornaments of pure gold enriched with gems that fell to the conquerors would scarcely be credited were the details recorded by less trustworthy authors, or not corroborated by some few works of the same age which have fortunately descended to us.

The church shared largely in this wealth; crosses, reliquaries, and sacred vessels of all kinds were made of the most costly material and encrusted with gems. One of these ancient works may still be seen in Cologne Cathedral—the chalice, or reliquary, containing the reputed skulls of the three Magi, of whom we shall soon have to speak more fully. This remarkable work is studded all over with engraved intaglios of Roman workmanship. Churchmen at this time were clever artificers, and St. Dunstan, great statesman as he

was, in the British, and St. Cloi, in the Gallic church, both skilled working goldsmiths, have since become the patron saints of confraternities of their followers.

The higher clergy on all solemn occasions displayed much personal decoration. A jewelled ring was part of the adornment of a bishop when arrayed in full pontificals. It indicated his rank, was made for him, and buried with him. The treasures of our old cathedrals still possess a few of these rings. One of the earliest and most curious is kept by the Dean of Winchester, and is represented in Fig. 45. It was found during the repair of the choir, under the tomb of William Rufus, and is supposed to have been the pontifical ring of Henry de Blois, cardinal, and Bishop of

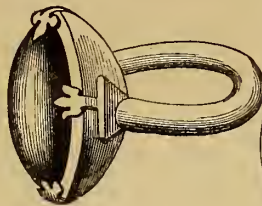


FIG. 45.



FIG. 46.

Winchester, A.D. 1129. It is a massive ring of solid gold, set with an oval irregularly-shaped sapphire, *en cabochon*, polished only, not cut, held in its heavy socket by four fleur-de-lys, and still further secured by drilling through its centre a passage for a gold wire—a reckless way of treating valuable jewels which is characteristic of almost all these early works.

Fig. 46 is an ordinary pontifical gold ring of investiture used in the Anglican Church about this time. It was found at Winchester, and is preserved with Fig. 45, described above. It has a very massive setting for a large blue sapphire, and is very characteristic, though simple in its design.

Dignity, as exhibited by weight and simplicity, seems to have been chiefly regarded in the design of these old episcopal insignia.

In the sacristy at York Minster is preserved a very excellent specimen (Fig. 47); this was found in the tomb of Archbishop Sewall, who died in 1256. With it is kept another fine ring, of more elaborate design (Fig. 48), which was discovered in the tomb of Archbishop Greenfield, who died in 1315. The foliations which



FIG. 47.



FIG. 48.

curl around the central stone and its setting take the prevailing forms adapted in architectural enrichments of the archbishop's age. The stones usually chosen for such rings were ruby, emerald, or crystal, and had a significance usual with all things connected with the Roman Catholic Church; ruby indicated its glory, emerald its tranquillity and happiness, and crystal its simplicity and purity. The diamond typified invulnerable faith, the sapphire hope, the onyx sincerity, the amethyst humility.

In the old romance of "Sir Degrevant" we are told that at the marriage of the hero there came

"Archbishops with rings
More than fifteen."

In the romance of "King Athelstan" (also a work of the fourteenth century) the king exclaims to an offering archbishop—

"Lay down thy cross, and thy staff
Thy mitre and thy ring, that I to thee gaff—
Out of my land thou flee."

DR. THOMAS ARNOLD, of Rugby, learned German at forty in order that he might read Niebuhr in the original. Let these examples tell upon the general character, and invigorate and cheer all undertakings.

PATENTS.

Applications for Letters Patent.

4292. WILLIAM JACKSON, of Birmingham, in the county of Warwick, Jeweller, for an invention of "Improvements in lockets, brooches, bracelets, and other like ornaments and ornamental fastenings."—Dated 10th December, 1875.
4333. MARIUS ANTHONY PRADIER, of 7, Bedford Street, Bedford Square, in the county of Middlesex, Manufacturing Jeweller, for an invention of "A new and improved method of fastening and unfastening the shirt, collar, or other stud, sleeve-link, and solitaire, by means of the screw principle."—Dated 14th December, 1875.
4367. FERDINAND MÜLLER, of Birmingham, in the county of Warwick, Merchant, for an invention of "Certain improvements in keyless watches."—A communication to him from abroad by Proelochs Freres, Schaffhouse, in the republic of Switzerland.—Dated 10th December, 1875.
4403. RICHARD QUIN, of Poland Street, Oxford Street, in the county of Middlesex, trading under the style or firm of Moran and Quin, Jewellery Case Makers, for an invention of "Improved opening and closing arrangements applicable to cases for containing jewellery, plate, papers, pictures, and other articles."—Dated 18th December, 1875.
4498. JUAN NEPOMUCENO ADORNO, of Harley Street, Cavendish Square, in the county of Middlesex, Gentleman, for an invention of "Improvements in watches and clocks."—Dated 24th December, 1875.

Notices to Proceed.

2917. ALFRED JOHN HIGHAM, of 13, Blackheath Terrace, Blackheath, in the county of Kent, Gentleman, has given the like notice in respect of the invention of "Improvements in clocks and other timekeepers."
3212. HERMANN VAN DYK, of 12, West Smithfield, in the city of London, has given the like notice in respect of the invention of "Improvements in reticules, travelling bags, jewel cases, dressing-cases, work boxes, and other similar receptacles."

Patents Sealed.

2242. JOSEPH NORMAN HARMER, of Whittlesea, and ALFRED STAFFORD WRIGHT, of Doddington, both in the county of Cambridge, for an invention of "Improvements in the manufacture of watchmakers' peg-wood and other similar articles, and in tools or apparatus employed therein."—Dated 18th June, 1875.
2310. ALFRED LITTLEHALES, of Birmingham, in the county of Warwick, Engraver, for an invention of "Improvements in fastenings for solitaires, sleeve-links, shirt and other studs, cravats, neck-ties, neck and other bows, and other articles."—Dated 24th June, 1875.
2335. AUGUSTE CONOD, of Lausanne, Switzerland, now of 8, Southampton Buildings, London, Watch and Clock Manufacturer, for an invention of "Improvements in electric clock apparatus, parts of which are applicable to ordinary clocks."—Dated 26th June, 1875.
3118. BENJAMIN JOSEPH BARNARD MILLS, of the firm of Harris and Mills, of 23, Southampton Buildings, in the county of Middlesex, Patent Agent, for an invention of "Improvements in watches."—A communication to him from abroad by Henri Jacot-Burmman, of Bienne, in the Canton de Berne, in the Swiss Confederation.—Dated 6th September, 1875.
3677. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an invention of "An improved diamond holder and method of inserting, fitting, and securing diamonds in metallic holders."—A communication to him from abroad by Joseph Wild Branch, of Saint Louis, Missouri, United States of America, Manufacturer.—Dated 22nd October, 1875.

Grants of Provisional Protection for Six Months.

4333. To MARIUS ANTHONY PRADIER, of 7, Bedford Street, Bedford Square, in the county of Middlesex, Manufacturing Jeweller, for the invention of "A new and improved method of fastening and unfastening the shirt, collar, or other stud, sleeve-link, and solitaire, by means of the screw principle."
367. To FERDINAND MÜLLER, of Birmingham, in the county of Warwick, Merchant, for the invention of "Certain improvements in keyless watches."—A communication to him from abroad by Proelochs Freres, of Schaff house, in the republic of Switzerland.
4403. To RICHARD QUIN, of Poland Street, Oxford Street, in the county of Middlesex, trading under the style or firm of Moran & Quin, Jewellery Case Makers, for the invention of "Improved opening and closing arrangements applicable to cases for containing jewellery, plate, &c."

Patents which have become Void.

LETTERS PATENT for INVENTIONS which have become VOID by reason of the Non-payment of the additional Stamp Duty of 50l., before the Expiration of the Third Year from the date of such Patents, pursuant to the Act of the 16 Vict., c. 5, sec. 2.

3838. FRITZ ROBERT-THEURER, of the firm of Robert-Theurer et fils, of Chaux de Fonds, Switzerland, Manufacturer, for an invention of "Improvements in apparatus for winding and setting the hands of watches."—Dated 17th December, 1868.
3866. THOMAS KENNELLY, of Birmingham, in the county of Warwick, Gas Fitter, for an invention of "Improvements in blow-pipes used in soldering and brazing metals, and for other purposes."—Dated 20th December, 1872.
3885. LAURENTIUS ANDREAS WALDEMAR LUND and EDMUND ANMANN, both of 60, Chandos Street, Strand, in the county of Middlesex, for an invention of "Improvements in the manufacture of brooches, buttons, solitaires, and other articles of jewellery."—Dated 21st of December, 1868.

Grants of Provincial Patents For Six Months.

3881. To THOMAS PERKS, the younger, of the firm of Thomas Perks and Sons, of Birmingham, in the county of Warwick, Jewellers, for the invention of "An improvement or improvements in earrings."

Patents Granted in Foreign States.

FRANCE.

- 107,900. MOTT, for "Improvements in the calendar motion of clocks and watches."—Dated 30th April, 1875.
- 107,925. DURIEZ, for "Improvements in Jewellery."—Dated 1st May, 1875.
- 107,927. EDGE, for "Improvements in the manufacture of the movable heads of watch-chains, &c."—Dated 1st May, 1875.
- 108,186. EATON, for "Regulating chronometers, watches and clocks."—Dated 27th May, 1875.
- 108,195. LEFEVRE, jun., for "An eight-day night and day clock."—Dated 28th May, 1875.

BELGIUM.

- 38,192. J. DAMOISEAU, of Andenne, for "A mysterious clock."—Dated 9th November, 1875.

UNITED STATES.

- 169,378. DAVID SHIVE, of Philadelphia, Pa., assignor to the Shive Governor Company, for "Watchmen's registers."—Application filed 10th October, 1873.
- 169,453. EZRA MAC NUTT, of Philadelphia, Pa., for "Watch-regulators."—Application filed 8th May, 1875. *Brief.*—"A set-screw in the nut attached to a micrometer watch-regulator, for the purpose of holding the nut in the same position when taken apart for repairs, &c., and an adjustable curb-pin, in combination with a stationary curb-pin, for the purpose of clamping or loosing the hair-spring, as may be required."
- 169,512. JOHN K. BIGELOW, of Springfield, Ill., for "Watches."—Application filed 2nd April, 1874.

Designs Patented in Foreign States.

UNITED STATES.

8785. EDWARD E. BARROWS, of Attleborough, Mass., for "Watch-chain links."—Application filed 15th September, 1875.—Term of patent $3\frac{1}{2}$ years.
8786. DANIEL A. BEAM, of Newark, N.J., for "a Chain-link."—Application filed 23rd October, 1875.—Term of patent $3\frac{1}{2}$ years.
8789. HERMANN J. MULLER, of New York, for "Clock-eases."—Application filed 29th October, 1875.—Term of patent 7 years.
- 169,687. HENRY PICK, of New York, N.Y., for "Globe attachments to clocks."—Application filed 23rd October, 1875.
- 169,775. JOHN S. CARROW, of Philadelphia, Pa., for "Clicks for bracelets."—Application filed 19th August, 1875.
- 169,787. VICTOR DORHOT, of Bristol, Tenn., for "Watch-plates."—Application filed 15th September, 1875. *Brief.*—"A top plate made in removable sections, with flange rigidly attached thereto, forming the dust-cap, the movement being arranged in recesses formed in the top plate."
- 169,868. EDWIN WANT, of New Haven, Conn., for "Eye-glasses."—Application filed 26th June, 1875.
- 169,917. J. W. NYSTROM, of Philadelphia, Pa., for "Eye-pieces for telescopes."—Application filed 19th October, 1875.
- 169,929. JOHN N. THOMSON, of Providence, R.I., for "Bracelets."—Application filed 3rd March, 1875.

ITALY.

145. M. PETERSEN, of Altona, for "An escapement of chronometers."—6 years.—Dated 25th September, 1875.

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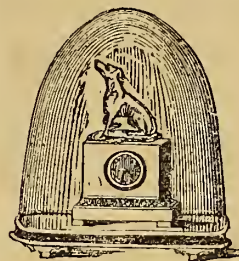
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STATION.	FROM LONDON.—WEEK DAYS.								SUNDAYS.		PULLMAN DRAWING ROOM SLEEPING CARS.	DOWN TRAINS—WEEK DAYS.
	a.m. Fast.	a.m. Fast.	a.m. Exp.	a.m. Exp.	p.m. Exp.	p.m. Exp.	p.m. Fast.	p.m. Mail.	p.m. Exp.	p.m. Mail.		
Victoria (L. C. & D.) dep.	7 50	8 48	10 55	2 0	2 50	3 55	7 42	...	1 35	7 35	The Celebrated American Pullman Drawing Room and Sleeping Cars, now run regularly by the undermentioned Trains on the Midland Railway.	10. 0 a.m. London (St. Pancras) to Manchester (Drawing Room Car).
Ludgate Hill ... "	8 25	9 24	11 28	2 32	3 25	4 32	8 18	...	2 10	8 10		4. 0 p.m. Manchester (St. Pancras) to Liverpool (Drawing Room Car).
Moorgate Street ... "	8 40	9 37	11 25	2 43	3 35	4 40	8 27	...	2 26	8 23		12. 0 p.m. Manchester (St. Pancras) to Liverpool (Drawing Room Car).
St. Pancras ... "	5 15	8 55	10 0	11 45	3 0	4 0	8 50	...	2 50	8 50		Ordinary Cars to Marple and Liverpool, and Ordinary Cars to Manchester.
Leicester ... art.	7 26	11 39	12 17	2 20	5 27	6 19	7 21	11 29	5 24	11 29		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).
Nottingham ... "	8 14	12 35	1 10	3 25	6 15	7 10	8 13	12 25	6 20	12 25		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).
Derby ... "	8 18	12 40	1 10	3 23	6 27	7 9	8 15	12 24	6 20	12 24		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).
Manchester ... "	10 0	.....	3 0	5 5	8 10	8 45	10 0	.....	8 0	.....		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).
Liverpool (Central) ... "	11 15	.....	3 50	6 5	9 0	9 40	11 25	.....	8 50	.....		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).
Sheffield ... "	9 4	1 18	1 55	4 11	7 45	.....	9 0	1 43	8 25	1 43		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).
Leeds ... "	10 23	2 35	3 0	5 35	9 5	.....	10 10	3 0	10 20	3 0		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).
Bradford ... "	11 10	.....	3 25	6 15	10 10	.....	10 35	3 55	11 20	3 55		12. 0 p.m. Manchester (St. Pancras) to Leeds, Bradford, and Liverpool (Drawing Room Car).

STATION.	TO LONDON.—WEEK DAYS.								SUNDAYS.		PULLMAN DRAWING ROOM SLEEPING CARS.	UP TRAINS—WEEK DAYS.
	a.m. Mail.	a.m. Exp.	a.m. Exp.	a.m. Exp.	p.m. Fast.	p.m. Exp.	p.m. Fast.	p.m. Mail.	p.m. Fast.	p.m. Mail.		
Bradford ... dep.	...	...	9 20	9 30	11 55	2 30	4 30	5 0	9 15	1 20	The Celebrated American Pullman Drawing Room and Sleeping Cars, now run regularly by the undermentioned Trains on the Midland Railway.	9.30 a.m. Bradford to London (Drawing Room Car).
Leeds ... "	2 40	...	9 45	10 35	12 50	3 0	4 45	5 40	10 5	2 15		10.30 a.m. Manchester (St. Pancras) to London (Drawing Room Car).
Sheffield ... "	4 12	8 0	10 39	12 5	2 20	4 30	5 55	6 58	11 26	4 17		12. 0 p.m. Manchester (St. Pancras) to London (Drawing Room Car).
Liverpool (Central) ... "	...	...	...	10 30	12 0	2 35	4 0	...	9 45	4 0		Ordinary Cars from Liverpool, and Ordinary Cars from Manchester.
Manchester ... "	...	7 0	...	11 10	1 0	3 35	4 50	...	10 35	4 50		4.50 p.m. Manchester to London (Drawing Room Car).
Derby ... "	6 15	8 38	10 20	12 56	3 10	5 15	6 40	...	1 0	6 53		9.45 p.m. Liverpool to London (Sleeping Car).
Nottingham ... "	6 15	8 40	11 15	12 55	3 15	5 15	6 40	7 45	12 55	6 35		10. 3 p.m. Leeds to London (Sleeping Car).
Leicester ... "	7 25	9 32	12 5	1 46	4 9	6 3	7 35	8 50	2 0	7 28		10. 3 p.m. Leeds to London (Sleeping Car).
St. Pancras ... arr.	10 30	12 0	2 20	4 5	6 40	8 40	10 0	11 35	4 30	10 5		10. 3 p.m. Leeds to London (Sleeping Car).
Moorgate Street..	10 46	12 14	2 35	4 26	6 57	8 57	10 13	...	...	...		10. 3 p.m. Leeds to London (Sleeping Car).
Ludgate Hill ... "	10 56	12 35	2 54	4 36	7 19	9 2	10 31	...	...	...		10. 3 p.m. Leeds to London (Sleeping Car).
Victoria (L. C. & D.) ... "	11 29	1 7	3 30	5 12	7 56	9 37	11 9	...	...	...		10. 3 p.m. Leeds to London (Sleeping Car).

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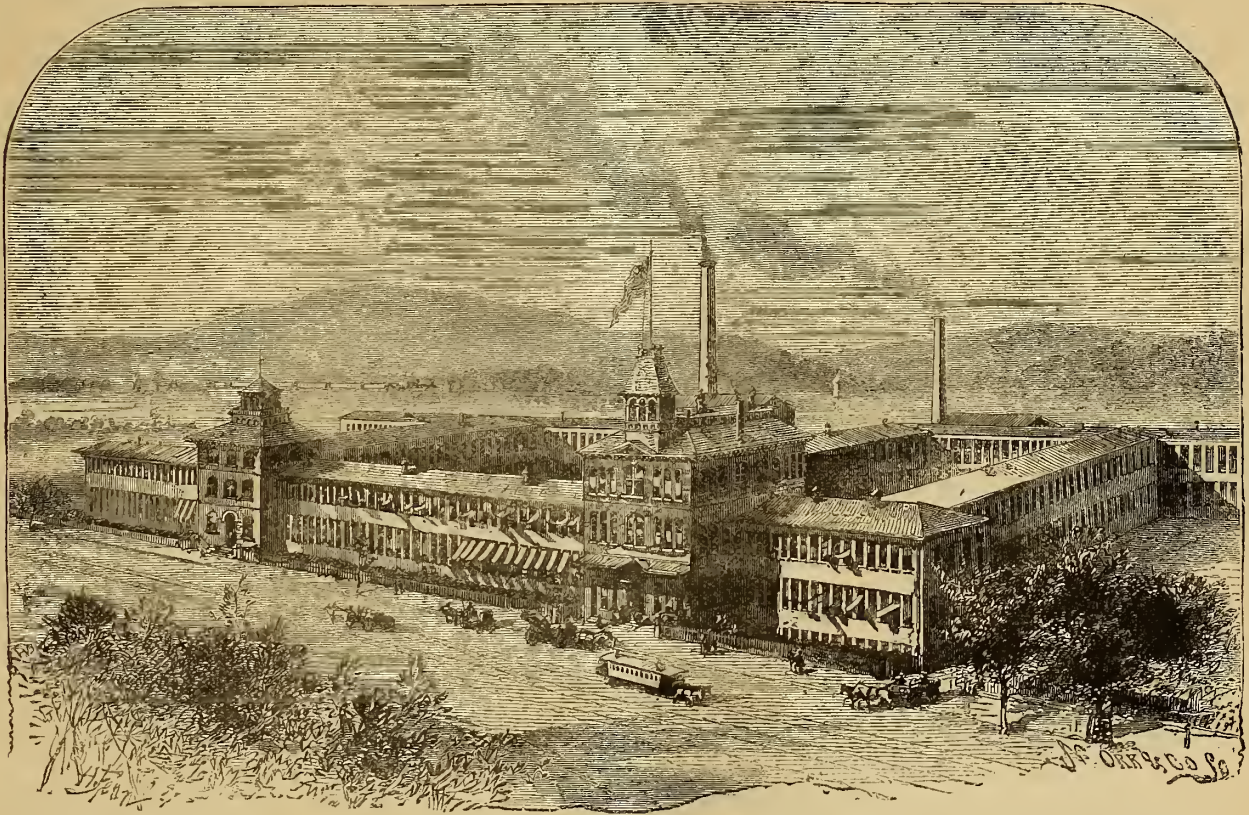
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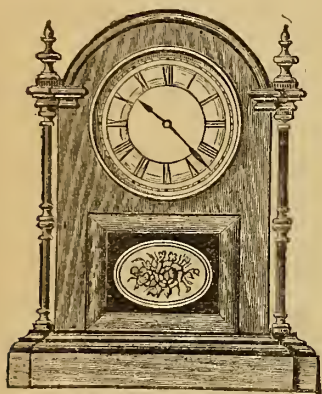
WHY American Waltham Watches are cheaper than English Watches of the same grade is explained by Sir Edmund Beckett (late Mr. E. B. Denison) in his work on Clocks, Watches, and Bells, in which he says, page 322: "Although labour is dearer in America than here, this machinery enables them to undersell English Watches of the same quality;" and that the system of making watches by machinery is the only correct one is held forth by this eminent authority in the same work, in which he says: "There can be no doubt in the mind of any one who understands machinery that this is the best as well as the cheapest way of making machines which require precision and uniformity."

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The Proprietors of this Journal, intending to compile a special article referring to and giving detailed account of the articles connected with the kindred trades represented by this Journal, and which are intended for the Philadelphia Exhibition, invite full information from any Exhibitors who would desire to have their articles mentioned in the List to be prepared for insertion in our columns. As the special article is intended to appear in our next Number early information is particularly requested.



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Devoted to the Interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades.

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HOROLOGY.

(Continued.)

VIII.—DIALLING.

BEFORE we enter upon the general features of the present paper we had better explain a term, if we have not already done so, that has been frequently used in these articles; that is, the term "prime vertical." The reason why we mention it now is that we have heard of some of our interested readers saying that they do not clearly comprehend what a "prime vertical" means. It is very simple. A prime vertical is the plane perpendicular to the horizon; that is, if you open a book, let one half lie flat on the table, and the other half straight up, or perpendicular to it, the straight-up side is the prime vertical. In other words, the wall of the house or garden is the "prime vertical" to the surface of the ground. These few words are necessary, for so long as learned persons will continue to use learned phraseology, so long will unlearned persons, like ourselves, require explanations.

This very "tall talk" is a damnifying vice of many writers of the present day. Only this very morning we took up a daily paper that especially cultivates the patronage of the million, and what did we find? Why, in the first fourteen lines of one leading article there were no fewer than three Latin quotations! and, what was worse, there was not the slightest necessity for the use of any one of them, as the meaning could have been far better and more forcibly expressed in plain, sturdy English. Some time ago the same paper had an article on domestic cookery, in relation to the school lectures upon that subject at South Kensington. That article was especially

addressed to the wives of the artisan class; but it was so overlaid and be-plastered with French interlarding from Parisian cookery books as to be utterly unintelligible to any person who had not mastered what we may call the kitchen slang of continental hotel life. And this article was professedly written for the enlightenment of the wives and daughters of English working men! Of course it was received by them with the contemptuous laughter and disgust that it deserved. All sensible scholars have been long agreed that there is nothing whatever connected with English life, in its working, its playing, its fighting, and its praying, that cannot be well and forcibly expressed in the sonorous, copious vocabulary of the country.

Again, one of the special trades-union weekly papers, which one might suppose would particularly consider the linguistic acquirements of those for whom it professes to exist, gives in a recent number an account of the opening of the new Aquarium at Westminster. But it cannot get along without what is little better than a slang expression that may sometimes be seen in the columns of half a dozen newspapers within a day or two of each other; it occurs thus: "The *raison d'être* of the Royal Aquarium," &c. Now the English of this *raison d'être* is simply the reason why a thing was made, or built, or is in existence. Further on visitors are changed into *habitués*, whilst a glance or striking appearance becomes a *coup d'œil*. In another place we saw a leading article open with, "For some occult and esoteric reasons," &c. Now esoteric is from the Greek *esoteros*, hidden, mysterious, whilst occult is from the Latin *occulto*, meaning exactly the same thing; and both of them are combined in the common, easily-understood English word "secret." It will thus be seen that this grandiloquent kind of writing is the merest and most contemptible "snobbery" of its kind that can be imagined. Indeed there are two well-known daily papers in which

two writers can always be traced; the one by his inability to get along without *raison d'être*, and the other by the impossibility of his moving through a leading article unless he has "occult and esoteric" close to him. What would be thought in common-sense society if a maker sent round a descriptive note of something he had with an "occult and esoteric" spring, and the moment that the box or case was opened, instead of the appearance being surprising, it would present "the coup d'œil?" Why, he would be laughed at for a "stuck-up fool," and very properly so, too. An odd expression, now and then, by way of a change, may be pardonable; but the perpetual "cadishness" of the "high falutin'" school is intolerable, and should always be resented whenever it makes its appearance. One "largest-circulation-in-the-world" newspaper has long had an unenviable notoriety in this respect. We have been induced to make these observations as a protest against the use of unwarrantable non-English quotations in writing, especially for readers, the great bulk of whom have had to earn their own "living" since they were about fourteen or fifteen years of age. When the reader was put into the workshop to learn how to fight the battle of life, these writers were, probably, being stuffed full of Latin and Greek. When readers and writers meet in after years in the columns of the "penny daily," the understanding of the one is "fogged," not to say insulted, by what is, in our humble opinion, mistakenly called the "learning" of the other.

Having thus expressed ourselves, we will now proceed on our usual way.

As we have previously dealt with the mode of constructing a south dial, we will now face to the right-about and speak of the opposite point of the compass.

A north dial, or erect direct north dial, to be precise, is one that we describe on the surface of the prime vertical, looking northward. Unless under very exceptional circumstances, we very much doubt whether any of our readers ever saw a north dial; probably they may have seen it without knowing what it was. We are all well aware that the sun only shines upon the northern dial surface when advancing from the east to the prime vertical, and from the same vertical to the west; and when we see that he is in or on the prime vertical at six o'clock in the morning, and again at six o'clock in the evening, a north dial will only show the hours before six a.m. and after six p.m. From this it is conclusive that, as in autumn and winter the sun does not rise before six o'clock, and sets before six in the afternoon, a north dial is useless during the time mentioned. The way, therefore, to make "a complete job" of it, is to join a north dial to a south one, which junction will give all the hours that the sun is above the horizon. We will now state how to make a vertical north dial.

From the central point A, in the upper third of the plate, draw a meridian line to the extremity, making a small circle of any size round the same point. At A make an angle, which we will call D A C, equal to the elevation of the equator, C being on the meridional line. Then from C, taken at pleasure, erect a perpendicular or line from the extremity of D, which will be C D, meeting the line A D, as has been stated. Next make another angle from D, similar to A D C, touching the meridian at E, which will be the angle C D E. On the meridian, from the point E, with the distance E D, mark off to a point, which we will call B, or, for difference' sake, we will place I beside E, and call that distance I B. We have now A at one extremity of the meridional line, and will mark the opposite extremity as S. Again, take I B, equal to E D, and draw that distance at right angles to the meridional line. From B, with the radius B I, describe a quadrant, or the fourth part of a circle exactly, which divide on the arc into six equal parts. Through the two extreme division lines of this arc, from B, draw lines to the edge of the plate, and where one cuts the line from right to left mark it as B d. Prolong this last line on each side, and mark the extremities G and H from B, making the first division of the quadrant next to A, draw a line extending to H. Do the same on the side of G, and where the corresponding quadrant division line to B d cuts the line G H, mark it h; this will make I h on one side equal to I d on the other of the meridional line, as well as I G equal to I H. Now take a ruler and lay it on so as to touch the point A, and where the line B d cuts the line G H, and to A and H, and A and G, and on the opposite side to A and h. Then draw the lines pointed out, and also a horizontal line through the centre A. Then the extremities of those lines will be the hours of 4, 5, and 6 respectively, on the G side, and 6, 7, and 8 on the H side. But we have not done yet. Lastly, in A fix an oblique index A D, making an angle D A E, with a meridian line in the plane of the meridian, equal to the elevation of the equator. Or, instead of this index, put a triangular plate E D A, on the meridian line A E, perpendicular to the plane of the dial. Then, as we have just mentioned, A4, A5, A6, will be

the hours of the forenoon; and A6, A7, and A8, will be the hours of the afternoon, as will be shown by the shadows of the several indexes. Or, again: Take a south dial, whose construction has been previously published, and, if the hour-lines 4 and 5, together with 7 and 8, be continued beyond the 6 A6, and the triangle A D E turned about its pole A till A E fall directly against A12, it will be converted into a north dial, minding what has been said about the reversal of the hours.

We do not know whether it is of any importance to describe how to draw a vertical north or south dial trigonometrically; but we will just allude to it. These dials only differ from the horizontal in this wise. That the angle formed by C A D is equal to the complement of the elevation of the pole of the place; so that the same method of reasoning, for those who care to pursue it, will serve as for the horizontal one. We do not suppose that many of our readers will try the trigonometrical method; but should they do so they will make the second term the complement of the elevation of the pole of the place. They will please to bear in mind, too, that a "complement" is, in geometry, the defect of an angle from a right angle; and that the defect of an angle from two right angles is called its supplement. Such hints, now and then become useful, as they are apt to stimulate some further inquiry on the part of the aspiring student.

(To be continued.)

HOROLOGICAL TELEGRAPHY IN AMERICA.

WE have been favoured by Messrs. Barraud & Lund, of Cornhill, with the following extract from a letter received by them from the well-known house of Messrs. Bond & Son, at Boston, Mass., U.S.A., relative to horological telegraphy there:—

"We have read the paper received from you with much interest" (alluding to the article on "Horological Telegraphy," in the November number of this Journal), "and it may interest you to know how it is arranged here. The subject of the telegraphic transmission of time signals is one of very great importance, and, although its introduction here has been comparatively recent, its use is rapidly becoming general. The first step was taken about twenty years ago, when we built a private line to the Cambridge Observatory, and received signals every day at noon by taps, and for many years we sent signals in the same way once a week to numerous railroad centres, watchmakers, &c., within a radius of three hundred miles, carrying a chronometer to the different telegraph stations for that purpose.

"About eight years ago, however, we erected a clock at the Observatory, at Cambridge, which was arranged to break the electric circuit and send a signal every two seconds, omitting the signal on the 58th second, so as to leave an interval of four seconds before each minute; and also omitting about twenty-five seconds before each five minutes. These signals came into the city over an independent wire, which is there by a relay divided into two circuits, one for the northern and the other for the southern section of the city. These wires run to all the railroad depôts, public offices, telegraph offices, and such other stores as desire it, the signals being given either by a vibrating needle or by a sounder; this last being usually preferred. Every morning also the various railroads put their own telegraph lines in connection with the time wire by relays, and sent the signals for a certain time to all their stations; one road, having ten branches, has a very large relay, with connections for each branch, so that all the stations on all the branches received the signal at the same time.

"In relation to the speed of the telegraphic signal, some interesting experiments were lately made at the Cambridge Observatory, when a signal was sent to San Francisco and back (nearly 7000 miles), with the departure and return of the signal being recorded on the cylinder of a chronograph; the difference in time was 0.7 seconds; and further experiments, with shorter loops, showed that this loss was due entirely to the relays, each relay causing a loss of 0.1 second."

THE ASTRONOMER ROYAL.

AS a recognition of the valuable and lengthened services of Sir George Airy, the Astronomer Royal, it has been determined by the Treasury that, as a special instance, the salary of this appointment shall be increased, but that on the resignation of the present Astronomer Royal it will revert to 1000*l.* per annum.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 130.)

SULLY, writing in 1724, says that there were a number of watchmakers throughout Europe who, knowing the high value set upon English watches, made no scruple to apply the names of the most skilled masters to their vile productions. That watches of British make were highly esteemed both by the noble and the scientific the following anecdote will serve to illustrate:—Mau-pertius, a French mathematician, was made prisoner at the battle of Molwitz and taken to Vienna. The Grand Duke of Tuscany, afterwards emperor, pleased at seeing a man of such great reputation, treated him with marked kindness, and asked him whether he regretted the loss of any particular property which the Hussars had taken from him. Being much pressed to answer, Maupertius acknowledged that he wished to have saved a watch of Graham's make, which he had used in his astronomical observations. The duke also had one by the same maker, but it was enriched with diamonds. "See," said he, taking the watch from his pocket, and presenting it to the *savant*, "it was but a joke; they have brought it to me, and I now return it."

The reputation of Graham's watches was very great during the last century, and he became the fashionable watchmaker of the day. The *London Magazine* for 1753 gives us an account of the ingredients required in the manufacture of a top—"Monsieur A-la-mode." One was—

"A repeater by Graham, which the hours reveals,
Almost overbalanced with knick-nacks and seals."

Lord Chesham has the following choice and curious watches:—A watch with an Oriental agate case, set round in front with sparks of diamonds mounted in gold. It is attached to a short gold chain, and it was made by Graham. A gold double-case repeater-watch, pierced and chased in relief with Orpheus and animals, by the same maker. It is attached to a chatelaine chased with trophies, from which are suspended two heart-shaped locketts and two boxes. A gold double-case watch chased in relief with the offerings of the Magi. Graham made this one also. It is suspended from a chatelaine, from which hang two seals, two broloques, and a miniature of a lady. A gold repeater-watch in a double-case, chased and pierced with busts and scrolls, by the same maker. It is attached to a short gold chain. A double-case repeater-watch chased and pierced with coronets and scrolls. On the back are a cipher and coronet set with diamonds. The maker was Collier, of London. It is attached to a chatelaine containing a compass, calendar, seal, small watch in a filigree case, and two keys. A gold watch, made by Jodin, of Paris, attached to a chatelaine, both being enamelled with hawking animals, and birds; and with them are two enamelled scent-boxes and a key. And a gold watch set with diamonds, the centre of the case being a bloodstone. The maker was Hubert. It is suspended from a chatelaine, to which also hang a tassel and locket containing hair.

The Royal Society are in possession of a gold watch which was presented by Mrs. Conduit to Sir Isaac Newton, who was born in 1642 and died in 1727. The chasing on the outer case is beautifully executed, and represents Britannia pointing to a medallion, on which is a bust of the philosopher.

At a meeting of the Society of Antiquaries of Scotland, held on April 11th, 1864, an account of a gold watch, which was said to have belonged to Prince Charles Edward Stuart, was read by Mr. George Seaton. It appeared that this watch belonged to a lady who had then recently died in reduced circumstances, and that her maternal grandmother was the eldest sister of John Leslie, the eighth and last Lord Lindores, who died without issue in the year 1814. In the belief that this watch had formerly belonged to the prince, and that the King of Sardinia was then the representative of the house of Stuart, its late owner bequeathed it to that monarch. Mr. Seaton pointed out that in this last matter she was clearly mistaken, as the representative of the house of Stuart was Francis V. of Modena. The watch was described as having an unusual arrangement of the Roman figures on the dial, the hours being engraved on little lozenge-shaped plates, and the filigree case having as ornaments six white stones or crystals. Dr. John Alexander Smith exhibited a curious watch, the gift of Gustavus Adolphus to a Scottish officer in his service. It was oval in shape, with cases of rock-crystal set in silver, and an inscription, "*Donum Gust. Adolphi Regis Invicti Jacobo Braimer Tribuno Militum Virtutis Premium.*" The officer was Colonel Braimer, who is said to have married Lady Brunton, sister of General Leslie, who was created Earl of Leven, and it now belongs to his descendants, the family of the late Captain Braimer, R.N., of Falmouth. It was exhibited by the good offices of Mr. Ralph E. Scott.

The *Daily Post* of February 14th, 1729, contains the following:— "Whereas a Gentleman's Coach was robb'd by two Highwaymen, between 6 and 7 of the clock, the 11th Instant in the Evening, between Hyde Park Corner and the Back of Buckingham House, in the road to Chelsea, and took away a Gold Watch and a Diamond Ring, with some money and a Sword. The watch was made by Williamson, London; and in the Case was an Equation Table by Edmund Sturgis, Watchmaker, Dublin. And the Ring had this Inscription, H. B. Knt. obt. 1 July, 1714. To the Watch were two Seals, one a Crystal of Socrates' Head, set in Gold; another triangular with Arms engraved, viz. a Sable Cross Or, with the Arms of Ulster, and a Scutcheon of Pertence, bearing a Butterfly, Field Azure with three Bars Gule. If any of the above-mention'd are offer'd to Sale; or if the Watch, &c. be restor'd, the person apprehending, or restoring the said Watch and Ring shall have 8 Guineas Reward; to be paid by Mr. Pote, Bookseller, at Sir Isaac Newton's Head, Charing Cross, or in proportion for any Part. Among the Pieces of Money taken, there was a Half Crown of Philip and Mary. And on the Scabbard of the Sword there was engraved, on a thin Plate of Gold, Ralph Jackson, Dublin."

In the South Kensington Museum is a watch, with chatelaine, seal, and key attached, in gold richly chiselled and embossed. The length is seven inches and three-eighths and the diameter one inch and three-quarters. The date is about 1730; and it was purchased for 28*l*.

Lord George Littleton, between the years 1730 and 1740, wrote the following lines to Miss Lucy Fortesque, with a new watch —

"With me while present may thy lovely eyes
Be never turn'd upon this golden toy,
Think every pleasing hour too swiftly flies,
And measure time by joy succeeding joy."

"But when the cares that interrupt our bliss
To me not always will thy sight allow,
Then oft with kind impatience look on this,
Then every minute count—as I do now."

THE NEW FIRE-ALARM APPARATUS AT BRADFORD.

MESSRS. GILLET & BLAND, of Croydon, have recently fixed a new fire-alarm apparatus to one of the bells in the Town Hall, at Bradford. The apparatus, which is highly spoken of, operates in the following manner:—A hammer has been fixed to a lever close to the second bell above the hour bell. This lever is worked by a cam wheel, revolved by a weight attached to a chain which winds round a drum in a manner similar to an ordinary clock weight. The weight is released by means of a stout wire, which is worked by a lever in the police-office, and on being released the weight slowly descends, turning round the drum, which, acting on the hammer shaft, causes the bell to be struck a series of blows at intervals of ten minutes each, so that if a second alarm has to be rung before two or three seconds, the striking continues until the weight has run to the full length of the chain, which occupies about twenty minutes, and the weight has then to be wound to the top, but it has been so fixed that the time can be divided into two intervals of ten minutes each, so that if a second alarm has to be rung before the weight has been wound up, there will not be any difficulty arising from the weight being at the bottom. The sound caused by the striking of the bell is so different from the ringing of any other bell in the town that no confusion can well arise, and is so loud and distinct that it can be heard at a great distance.

THE METEOROLOGICAL SOCIETY!

THE annual general meeting of this society was held on the 19th ult., at the Institution of Civil Engineers, when the anniversary address was delivered by the President, Dr. Mann. In alluding to the establishment of a carefully-planned series of observing stations by the society, the President illustrated the absolute necessity of following out the inductive method of research in meteorology, and supported his argument by a reference to the history of all the leading branches of physical investigation, in which the prophetic insight of inspired minds had invariably had to be elaborated and perfected by the patient labour of subsequent observation and experiment.

Some curious and notable instances of the molecular effects of lightning discharge were exhibited during the delivery of the latter portion of the very interesting address. The various officers and the council for the ensuing year were then elected.

ANCIENT BROOCHES AND DRESS FASTENINGS.

THE ancient Irish brooch was unlike others worn in Scotland or England. It had a long central pin, with an open ring at its summit, allowing free motion to the bar which passed through it, and varied in size and decoration according to the rank of the

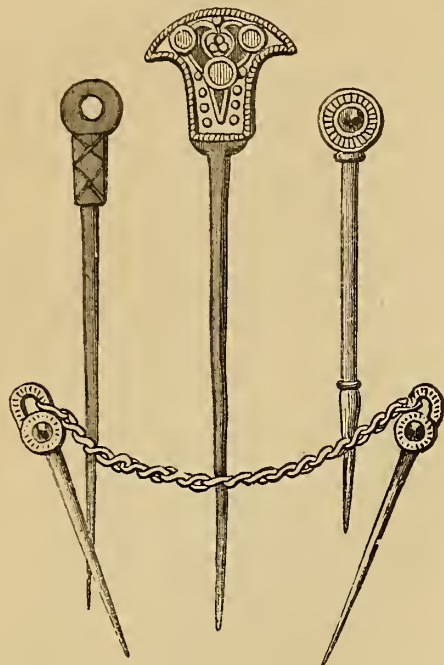


FIG. 23.

wearer. The highest price of a silver one for a king, according to Vallancey, was thirty heifers, when made of refined silver; the lowest value attached to them being three heifers. Larger specimens have been found and mistaken for poniards. They were made thus large and strong to pass easily through the thick woollen garments necessary to the cold, wet climate.

This old style of design in ornament continued in use in Ireland until the twelfth or thirteenth century—in fact until the inhabitants

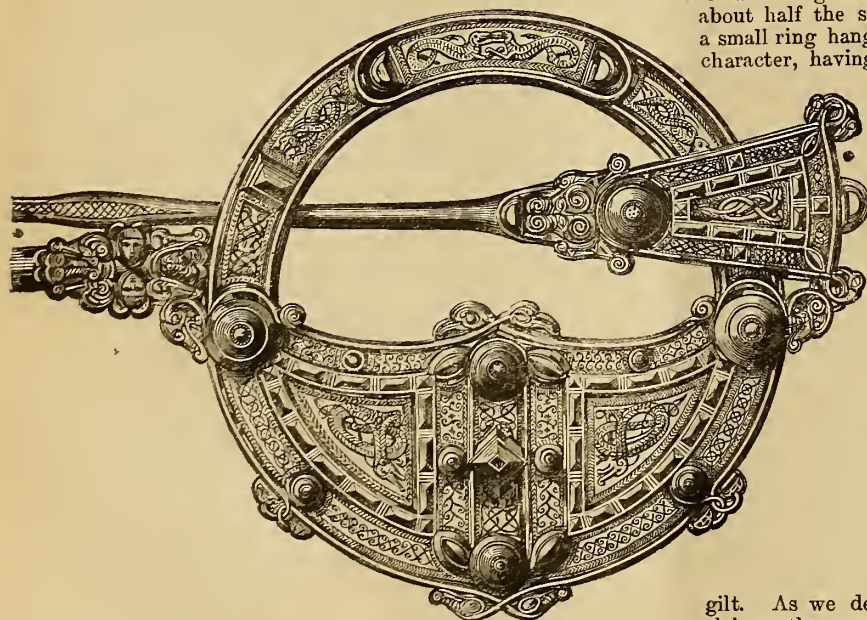


FIG. 24.

had destroyed its civilization by internecine war. Many works like the bell of St. Patrick, at Belfast, might, at the first glance, be attributed to the same era as the famous "Durham book" or book

of St. Cuthbert, now one of the treasures of the British Museum Library, and which is believed to have been executed, as early as the seventh century, by Eadfrith, afterwards of Lindisfarne, who died in 721. We are, however, certain as to the date of the bell, for an inscription is upon it, stating it was made to the order of Donnell O'Lochlain, one of the old Irish kings, who came to the throne in 1083, and died in 1121.



FIG. 25.

The first brooch discovered in Ireland is in the possession of Mr. Waterhouse, the goldsmith of Dublin. It is represented in Fig. 24, and is engraved the full size of the original, but the length of the long plain pin has been curtailed. It was found accidentally by a peasant near Drogheda. It is of bronze, decorated with gems and ornament in enamel, and may probably be of no earlier date than the bell just alluded to.

A simpler kind of ornamental pin was worn by the lower classes, of which I give two specimens in Fig. 25, A, B. They are engraved about half the size of the originals. The first is a plain pin, with a small ring hanging from its head. The second is unique in its character, having an old man's head at its summit; it is of bronze,



FIG. 26.

gilt. As we descend in the scale of rank these pins become plainer, the poorer classes using them of bone, roughly fashioned by themselves. The common kind of Scottish pin was of very similar character, as the example placed beside those last described will show. The head of the pin C projects some distance in advance of it, as seen in the side view. A small cross is in

the centre of the upper part; the other ornament is convoluted, and is brought into relief by chasing.

The ordinary form of the later Scottish brooch is that of a broad open circle, decorated with intricate knot-work or floral designs. Dr. Wilson, in his "Archæology and Pre-historic Annals of Scotland," has engraved one very similar, and says, "The interlaced knot-work appears to have been a favourite device of Celtic art. (Fig. 26.) It occurs on the sculptures, the jewellery, the manuscripts, and the decorated shrines and book-cases of early Irish Christian art, and has been perpetuated almost to our own day on the weapons and personal ornaments of the Scottish Highlanders."

The brooch has always been a favourite Celtic ornament, and is, indeed, almost indispensable to the Highland costume. It is worn universally by the Scottish Highlanders, both male and female, and in many Highland families of various ranks favourite brooches have been preserved through many generations as heirlooms, which no pecuniary inducement would tempt the humblest owner to part with.

REVIEWS.

Time and Time Tellers. By JAMES W. BENSON. London: Robert Hardwicke, 192, Piccadilly.

THIS excellent little work, recently published, contains much interesting and useful information, and although evidently not intended as a hand-book for the trade, will, nevertheless, enjoy a large circulation. It is well illustrated, and the typographical appearance is very creditable. In the first division of the work the author enters into a dissertation on "Time," and quotes suitably and copiously from the different poets as time's "best interpreters." The diversity of the titles of sun-dials is next explained, and the date of the invention of the clock well considered. Alluding to the period when the use of jewels was first invented and applied, the author states:—"About the year 1700 Nicolas Facio, a native of Geneva, having invented the use of jewels in watches, and failed in his attempt to persuade the Parisian manufacturers into the adoption of his notions, came to London. In May, 1705, he and two other watchmakers, Peter Debaufree and Jacob Debaufree, obtained a patent for his invention, to extend over fourteen years. In December, 1705, they petitioned for a more extended term, when the Clockmakers' Company opposed their application upon the ground that the invention was not a novel one, and in proof of their statement produced a watch made by Ignatius Huggeford, a member of their own Company, some time before the application of the pendulum-spring. As this watch had a large amethyst mounted upon the cock or pivot of the balance-wheel, the Committee of the House of Commons decided against Facio's petition and threw out his Bill. This watch has since then obtained an extensive historical reputation, and is preserved in the archives of the Clockmakers' Company as one of their most valuable treasures, for it is the earliest known English jewelled watch, and is the identical instrument produced before the House of Commons' Committee as evidence to upset, and which did upset, poor Facio's claim for an extension of patent. Alas! for ancient reputations, it has been but recently discovered that Huggeford's watch was but a fraud, and that the jewel on the cock, which deceived the Parliamentary Committee into supposing that Ignatius Huggeford, an Englishman, had applied jewels to watches long before Facio had been heard of, has nothing to do with the working of the watch. The jewel has been merely stuck on, just in the place where a jewel should be; but as it is only fixed to the surface of the brass and no pivot plays in the jewel, it may be averred that the amethyst has no more to do with the movement of the watch than the silver ornaments on the watch case. It is clear, by the words of Facio's petition, that his application of jewelling to watches was not merely done with the idea of ornamenting them—in that there would have been no novelty—and it seems probable that the amethyst would have been placed upon the face of the watch if the object of inserting it anywhere had simply been ornamentation; to speak plainly, none other than a fraudulent purpose could be served by its being placed where it is. It is, we fear, not impossible that the jewel was placed there at the instance of some of the members of the Clockmakers' Company, who being, perhaps, jealous of the foreign invention, and fearful of its effects upon their own private trade, were still unable to prevent the grant of a patent in May, 1703, for fourteen years to the inventor. But by December of that year, when application was made for the extension of the patent,

they had had time to consider affairs and to prepare their opposition. We may believe this watch to have been Ignatius Huggeford's and to have been all that it was sworn to be by the members of that Company, but when we remark that neither is any mention whatever made by them, nor, as far as it appears, any question asked of them before the Parliamentary Committee as to the jewel being upon the cock during the whole of the time of its being in their possession, we cannot but arrive at the conclusion that the jewel was placed upon Huggeford's old watch—the date of which could be shown—at the order of some of the members of the Clockmakers' Company, with the purpose of defeating the patent, and that the Committee of the House of Commons were not as careful as they ought to have been in inspecting the jewel, for if they had, they must have seen the want of connexion between the amethyst and the pivot, which it was pretended was working in it. The probability is that at this time our English watchmakers scarcely knew how to apply a jewel, or otherwise they would have inserted the pivot in a proper manner. The story is anyhow a very extraordinary one, for, supposing the Clockmakers' Company to be innocent of conspiracy on the subject, it must have been a miraculously curious whim which possessed old Huggeford to insert a jewel or an ornament in a place where it would not be seen, and still more wonderful that it should, sham as it was, be placed exactly where it should suit the purpose of after-litigation. Of course there can be no imputation arising out of this incident to affect the members of the Clockmakers' Company of the present time, for they are no more answerable for what was done above a century and a half ago than the Parliament of to-day is to be blamed for allowing the execution of Charles I., or for enacting the laws which led to the loss of our American Colonies."

(Review to be continued in our next.)

The Trade Marks Gazette, and Manufacturers and Exhibitors' Record, 8, Salisbury Court, Fleet Street, London. Fortnightly, price 3d.

WE have received the first number of this journal, the publication of which was most opportune, as it appeared almost simultaneously with the enforcement of the new Act of Parliament on Trade Marks which has just come into operation.

The paper, besides being well printed and smartly written, is replete with information, not only for those who have already adopted distinctive Trade Marks for their manufactures, but also for those who intend using them for the future. The provisions of the new Act will, if properly applied, tend greatly to promote better morals in commerce, and alike protect the manufacturer and consumer against fraud.

The Trade Marks Gazette promises to deal with these and other questions, and to afford concise data for the guidance of manufacturers. It will also be a valuable record of facts in connection with British and International Exhibitions. We cordially commend it to the notice of those trades with which we are so intimately connected.

MELTING AND MIXING.

IN answer to many inquiries we have to state that in 1871, or 1872, was published a very useful book on the above subject, which may now, we believe, be obtained at Chatto & Windus's, Piccadilly, on presentation of the trade card. It is called "The Private Book of Useful Alloys and Memoranda for Goldsmiths, Jewellers, &c." We do not know the price of it as we never possessed a copy, but we should think that it would be somewhere between three and four shillings—certainly not more than four. It is 7 in. by 5 in. and under half an inch thick. It contains nearly one hundred pages of tables of quantities for all the qualities of alloys and compositions known in the trade. We borrowed a copy for a particular purpose once, and were agreeably surprised at the exhaustive amount of information in it. Mr. Collins, the author, says that it is compiled from notes made by him from the papers of one of the largest and most eminent manufacturing goldsmiths in this country—the firm being no longer in existence was the cause of the publication of the book—and that every alloy, &c., in it may be relied on, as the memoranda and receipts are compiled from actual practice. We do not know if the publishers have any copies on hand; but whether or no, such a book is not likely to be re-published for some time. We speak now in the interests of the trade, as the book furnishes a complete guide to melting and mixing, to cupel, pot, and furnace.

THE QUEEN'S NECKLACE

(Continued from page 175).

THE prince was plunged into the most cruel distress. That the Queen, after all her promises, after all her engagements, after that passionate correspondence which had lasted for fifteen months, should deny facts clear as the day, should abandon Madame de Lamotte, and seek to destroy him—it was impossible! On the other hand, that Madame de Lamotte, whom he had dragged from the lowest depths of misfortune, should have deceived him so infamously for two years; that the writing of the Queen should be a forgery, the scene in the park a comedy, the payment of the 30,000 francs a last manœuvre designed to consummate the fraud—no, he could not bring himself to believe it. Still he felt himself enveloped in an impenetrable net. The events of the last few days, the recent interviews of the jewellers with the Baron de Breteuil, the peculiar tone of Bassange, the agitation and the tears of Madame de Lamotte—all foreshadowed a *dénouement* which was the more dreadful because it was uncertain. What, however, was he to do? Should he throw himself at the feet of the King, and avow the correspondence as well as the purchase of the necklace? Such a step—whatever might be the truth, whether he was the dupe or not of Madame de Lamotte—would compromise the Queen and ruin himself. Should he disclose everything to his family, to the Marshal de Soubise, to Madames de Marsan and Guéméné, and adopt with them some course which might prevent a public scandal? The prince had not the courage; he felt the ridiculousness of his position, and dared not confront it. The only person he consulted was Cagliostro, who, well inspired this time, advised him to go immediately to the King, and tell him everything that had happened.

"If I do so," replied the Cardinal, "that woman will be lost."

"If you do not," rejoined Cagliostro, "one of your friends will do it for you."

The prince, however, refused; and instead of extracting from Madame de Lamotte an avowal which would have saved them both, yielding to her influence to the very last, he consented to receive her into his *hôtel*, and kept her concealed there for two days.

After this last act, doomed to join indissolubly the fate of the Cardinal with her own, Madame de Lamotte quitted Paris on the 6th of August for Bar-sur-Aube, where she had prepared for herself a charming retreat. The same day Rétaux de Villette reached Switzerland. As to the prince, unwilling to the last moment to disclose his weakness, racked with anxiety, but incapable of taking a resolution, he awaited the progress of events. Three days after, MM. Böhmer and Bassange were sent for to the court. On the 12th they delivered to the Queen a memoir containing a history of the necklace; on the 15th the Cardinal was arrested at Versailles, in his pontifical robes and in presence of the whole court; and the next morning Madame de Lamotte was secured at her own residence in the country.

In spite of its complication, the intrigue of the necklace is now perfectly clear, so overwhelming everywhere is the evidence. From the day when Madame de Lamotte entered for the first time the *Hôtel de Strasbourg* until the day of her arrest, we see her acting, combining her means, arranging her plan, executing it, retouching it even, and correcting it in the heat of action, according as events unfolded themselves. We follow the tracks of the magnificent *parure*, which passed from the hands of Böhmer into those of the Cardinal, from the hands of the Cardinal into those of Rétaux de Villette. There is not an incident, not a detail, which cannot be proved from the confessions of the accused or the declaration of the witnesses.

At the beginning of the perquisition the Cardinal Prince de Rohan believed himself to be hopelessly lost. He had had time, it is true, to destroy his correspondence with Madame de Lamotte; he did not, however, know that the latter had also burnt all his papers during the few hours preceding her arrest. Plunged in this abyss, he could perceive at last, without being yet absolutely convinced, that he had been urged on by this woman; still he was ignorant as to how she had acted, what means she had adopted, what stratagems she had conceived. Perhaps he thought she was only an instrument which the hatred of his enemies had employed to destroy him. At the examination made at his hotel by the lieutenant of police, in presence of MM. de Castries, de Vergennes, and de Breteuil, he declared "that he was the victim of a cruel intrigue, the proofs of which were not in his possession." By degrees the light broke in upon the intrigue. Oliva, seized in Holland, confessed frankly the part she had played in the grove

scene. Villette, captured near Geneva, made corroborative disclosures, and confessed himself the author of the false signature, *Marie Antoinette de France*.

The Cardinal doubtless deserved the Bastille, but he ought not to have been sent there. His arrest, resolved on in a fit of anger, legitimate enough, was a blunder. By this step the court became unconsciously engaged in a struggle, the result of which could only be fatal to it. It had seen in the Cardinal a miserable needy man, who concocted the fraud of the diamonds to pay his debts. It forgot that he was the head of one of the greatest houses of France, a prince of the Church and the Empire. It never dreamt what subtle power lay in genuine *esprit de corps*. When it was bruited in Paris that the Cardinal had been arrested, and that it was about a necklace purchased in the name of the Queen, only one cry arose in the *salons of the noblesse*: "*Comment, pour un pareil chiffon, avait-on pu arrêter le Grand-Aumônier de France, en habits pontificaux, aux yeux de toute la cour? Comment, avait-on osé le mettre à la Bastille? Allait-on faire revivre, et contre les premiers de l'état, ce régime de lettres de cachet qui avait déshonoré le règne de Louis XV.?*" Moreover, such was the temper of the times, that the people refused to believe that the Queen was not fully conversant with the whole affair. Oliva was to them a mere myth; the signature forged by Rétaux de Villette they were convinced was a genuine signature, and they looked upon Madame de Lamotte as an instrument in the hands of the *Autrichienne*. No one now dares to echo these absurd and odious accusations. No sensible man can for a moment think that the Queen would procure clandestinely a *bijou* which the King had offered her; that if she had a desire to possess it, she would not have worn it; that she would have chosen, to make the bargain, a man whom she regarded as her enemy, and to whom since his return from Vienna she had not spoken a word; that she would have written those letters which Villette declared he had fabricated; that she would have induced Oliva to play that scene in the *bosquet* to avenge herself upon the prince; that she would have broken up the necklace and charged the Lamottes to sell the pieces; and lastly, no one can believe that, unable to pay the price, and yielding to the pressure of the minister of police, who had discovered the intrigue and threatened to inform the King of it, she should be infamous enough to abandon, and imprudent enough to allow to be dragged before the tribunals, at the risk of being overwhelmed by their revelations, those who were only her tools and accomplices. The evidence of history supports the hypothesis of common sense.

The court, however, made another blunder, and that was to bring the affair before the parliament. Louis XVI. gave the Cardinal the option of throwing himself on his clemency, or of being dragged before the parliament, accused of fraud. The Cardinal had no choice; to throw himself upon the clemency of the King was to avow himself guilty of an ignominious offence, and to sign his dishonour. He hesitated, however, a moment, in face of the risks and the dangers of a criminal trial; then he wrote to the King, "that he preferred the parliament as the surest way of unmasking the intrigue of which he was the victim, and to place in the clearest light his innocence and good faith." Thus, by a false spirit of equity, by the influence of new ideas, which were making themselves felt everywhere, by the desire of rendering homage to the forms or ordinary justice, perhaps also by the desire of humiliating the Cardinal, the court placed itself and the Queen in such a position, that they were tried by the parliament: it was to take an enemy for your judge; for at this period the parliament and the court were in angry opposition. The public also took part with the Cardinal. Those even who had laughed first at his disgrace ended by complaining that he was the victim of the Queen's vengeance. The emissaries of the houses of Rohan and Condé, skilfully making use of the secret press, interested the *bourgeoisie* and even the populace in the prince; the women wore red and yellow ribbons, which colours they named *Cardinal sur la paille*. He was said to be ill in the Bastille; the public expressed their indignation at the tardiness of a trial which placed his life in danger. They regarded as an unjust abuse of authority this delay of a verdict which must, no one doubted, proclaim the innocence of the prince and restore him to liberty.

(To be continued.)

THE half-yearly meeting of the British Horological Institute was held on the 18th ult. Want of space prevents our giving a detailed account of the interesting report and proceedings, but which we shall duly notice in our next.

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Adjudications of Bankruptcy.

BUNKER, W., Langley Moor, Durham, watchmaker.
FINBERG MARK, 40 Denmark-street, Middlesborough, travelling jeweller.
Jan. 12. Crosby, Reg.
WEBB H. A., Westgate-street, Gloucester, and of Lydney.

Liquidations by Arrangement or Composition.

BARRY JOHN C., Neath, watchmaker, Jan. 12. R. P. Morgan, solicitor, Neath.
BUNKER WILLIAM, Langley Moor, Durham, watchmaker. Jan. 5. James Chambers, solicitor, Durham.
CASHMORE JOHN, High-street, Southampton, watchmaker and jeweller.
DRACHMAN MORRIS, Lime-street, Middlesborough, jeweller. Jan. 20. T. Addenbrooke, solicitor, Middlesborough.
GENESE SAMUEL, Daulby-street, Liverpool, travelling jeweller. Jan. 6. Peacock and Cooper, solicitors, Castle-street, Liverpool.
GORDON SAMUEL, Taylor-street, Middlesborough, jeweller. Jan. 18. Thomas Addenbrooke, solicitor, Middlesborough.
HARRIS DAVID and JOSEPH HARRIS, trading as HARRIS BROTHERS, Vyse-street, Birmingham, jewellers' factors. Jan. 14.
JONES DAVID, Lamb Inn, Ystradyfodwg, Glamorgan, watchmaker. Jan. 20. Grover & Grover, solicitors.
LASKI N., March-road, Middlesborough, Bennett's-hill, Birmingham, jeweller.
LUNDY JAMES FREER, Cleethorpes-road, Great Grimsby, watchmaker, Jan. 10. Francis Summers, solicitor, Hull.
MANLOH PHILIP, Prescott-street, Darlington, jeweller. Jan. 11. J. E. Joel, solicitor, Newcastle.
MORLEY A. E., Temple-street, Birmingham, tool maker.
PHILLIPS ANN, Mott-street, Birmingham, jeweller. Jan. 10. John E. Smith, solicitor, Temple-street, Birmingham.
WEBB HENRY A., Westgate-street, Gloucester, and Lydney, goldsmith and jeweller. Jan. 3. Taynton & Sons, solicitors.
ZALLEWSKY JACOB, 8 Hill-street, Sunderland, jeweller. Jan. 5. Graham & Graham, solicitors, Sunderland.

Trustees and Commissioners Appointed.

ANDREOLI M. & M. & Co., Greenside-street, Edinburgh, carvers and gilders.
Tr. J. H. Balgarnie, 9 North-street, David-street, Edinburgh. Com., J. Elliot, 27 Cockburn-street, and G. Fowler, 38 West Register-street, both Edinburgh.
EDINGTON WILLIAM (Liq.), Spring-street, Paddington, jeweller, Trustee, James T. Snell, 15 Cheapside, accountant.
KUSEL CHARLES (Bkt.), 1 Bloomsbury-square, jeweller. Trustee, George A. Cape, 8 Old Jewry, accountant.
LINSLEY GEORGE W. (Liq.), Commercial-street, Leeds, gunsmith and jeweller. Trustees, James S. Burnfather, East-parade, accountant, and William Ramsden, Infirmary-street, estate agent, both Leeds.

Dissolutions of Partnership.

GILL J. & G., Grainger-street, West, Newcastle, jewellers. Dec. 7.
M'GREGOR & GARDNER, Queen-street, Glasgow, wholesale jewellers, &c. Sept. 1. Debt, by John T. & Robert Gardner.
ROWAN & Co., Charles-street, Sheffield. Silversmiths. Dec. 22.

Scotch Sequestrations.

M'RAE & CARMICHAEL, 20 Union-street, Glasgow, wholesale jewellers, also trading as CARMICHAEL & Co., Pollokshaws, watchmakers and jewellers, and JOHN M'RAE, 315 Crown-street, and JOHN CARMICHAEL, Houston-street, Glasgow, the individual partners of said Company, as such and as individuals. Jan. 4. Tr. and Com., Faculty Hall, Glasgow, Jan. 14 at 12. Claims by May 4. Agent, J. Carment, 32 Albany-street, Edinburgh.
SUTHERLAND & THOMSON, Glasgow, wholesale jewellers, and WILLIAM R. SUTHERLAND, and CHARLES C. THOMSON, both Glasgow, wholesale jewellers, the individual partners of that Company, as such, and as individuals. Dec. 31, with protection. Tr. and Com., Faculty Hall, Glasgow, Jan. 13 at 12. Claims by May 1. Agents, Robertson & Ross, Glasgow, writers.

Dividends Under Sequestrations.

STEPHEN CHARLES, Sauchiehall-street, Glasgow, jeweller. 1st, W. D. Quick's, 49 Bath-street, Glasgow, on and after Jan. 28.

ROYAL ASTRONOMICAL SOCIETY.

THE monthly meeting of this society was held on the 14th ult., Professor Adams, President, in the chair.

The following Fellows of the Society were duly balloted for and elected:—

Professor Cleveland Abbe; Washington William Barnsby, Esq., Saltmarsh Castle, Herefordshire; Rev. H. Collins, Vicar of Ellerton, near Whildrake, York; Augustus S. Harrison, Esq., Muir College, Allahabad; R. Coward Johnson, Esq., Warrenside, Blundellsands, near Liverpool; J. Young Messum, Esq., Controller of Packet Services, General Post-office; H. C. L. Saunders, Esq., Leacroft House, Staines; Major W. H. Wardell, R.A., 3, Alexandra-terrace, Sheerness, were balloted for, and duly elected Fellows of the Society.

A paper was read by the Astronomer Royal relative to the present state of the calculations for his "New Lunar Theory." Mr. Dunkin explained that the chief object of the Astronomer Royal in making these reports to the society was that he was anxious that the public might know exactly the state in which the calculations were if any accident happened to him. It would be remembered that when Mr. Delauney died there was no one who knew the state in which his work upon the lunar theory had been left.

A very interesting paper on the time of the phenomena of the transit of Venus was read by Captain Orde Browne.

Mr. Christie described a new form of solar eye-piece which he had devised.

Mr. Dunkin read a note by Mr. Webb on the variable star S. Orionis.

A paper by Professor Winnecke was read on some observations of the solar eclipse of Sept. 29, 1875, made at the new Observatory at Strasbourg.

Mr. Plumber read a paper on astronomical nomenclature.

A paper by Mr. Marth was read, containing ephemerides of the physical observations of Jupiter.

Messrs. Knobel, Barrow, and Neison were appointed auditors for the ensuing year.

This society has determined to present their gold medal to Leverrier, the distinguished French astronomer, for his researches into the phenomena of Jupiter, Saturn, Uranus, and Neptune. Many of his tables have already been utilized by the official astronomers of this country. The medal will be presented by his great rival and our distinguished countryman, Professor Adams, the present president of the society. M. Leverrier will deliver an address on the occasion, when a very large and distinguished audience will doubtless be assembled.

ROYAL MICROSCOPICAL SOCIETY.

A MEETING of the above society took place on the 5th ult., Chas. Brooke, Esq., F.R.S., Vice-President, in the chair. Attention was called to a number of specimens sent to the society by Mr. Hanks, of San Francisco; also some slides of *Aulacodiscus Rittoni*, presented by Mr. Thomas Curties, from material collected on the late Congo expedition by Mr. Martin, H.M.S. *Spiteful*. Mr. Chas. Stewart gave an interesting account of the structure and development of sponges, freely illustrating his remarks by drawings on the blackboard, and concluding by stating his reasons for believing that the well-known perforations in oyster shells were really the work of sponges. Mr. Hickie exhibited some photographs from Germany of *Navicula crassinervis* and *Frustulia saxonica*, and read letters from Dr. Rabenhorst and Herr Siebart in support of his opinion that the two were widely distinct. Three new fellows were admitted, and Messrs. Bevington and B. D. Jackson were elected auditors.

TO INTENDING EXHIBITORS AT THE FORTH-COMING EXHIBITION OF SCIENTIFIC INSTRUMENTS AT SOUTH KENSINGTON.

AN experienced and competent Journalist is prepared to undertake the position of Superintending Representative on behalf of one or several exhibitors not competing with each other. Or he will prepare and see through the press descriptive pamphlets (illustrated or not) of horological or other mechanical inventions and appliances. The advertiser is well experienced in both theory and principles of practical science. *Terms moderate.* Address "JOURNALIST," office of WATCHMAKER AND JEWELLER, 34, Hatton-garden, E.C.

"FAST BIND, FAST FIND."

FAST BIND, FAST FIND" is indeed among the oldest proverbs in our language; and not our language only, but, we may add, in the language family of Europe, if not of civilization. We may safely conclude that "kleptomania" is a disease as old as Adam—if not older—and that "convyancing" has oftentimes exercised the power of the keenest of wits, and, *per contra*, the most "cunning of fence." But what a stride from the traditional "old oak chest" of our ancestors to the fire and burglar proof safes of the present day! Let any one look at some of the prints of the strong German coffers, dear to the soul of the antiquary, with their many iron bands and rivets, and multiple locks, and see in what direction ingenuity went on behalf of "Fast bind, fast find." To those who are acquainted with the pages of Réaumur we may have some interesting words to say. The time is not two centuries old when the oak chest, with its three-hasp locks, was considered strong enough to hold a set of crown jewels! A modern lock-picker would have spent about five minutes in opening all the locks with a piece of bent wire; yet they had to be broken, because "no key was forthcoming to open them." The most notable of these "securities" in wood has three "tiers" of iron bar work riveted round it, crossed by others at short distances,

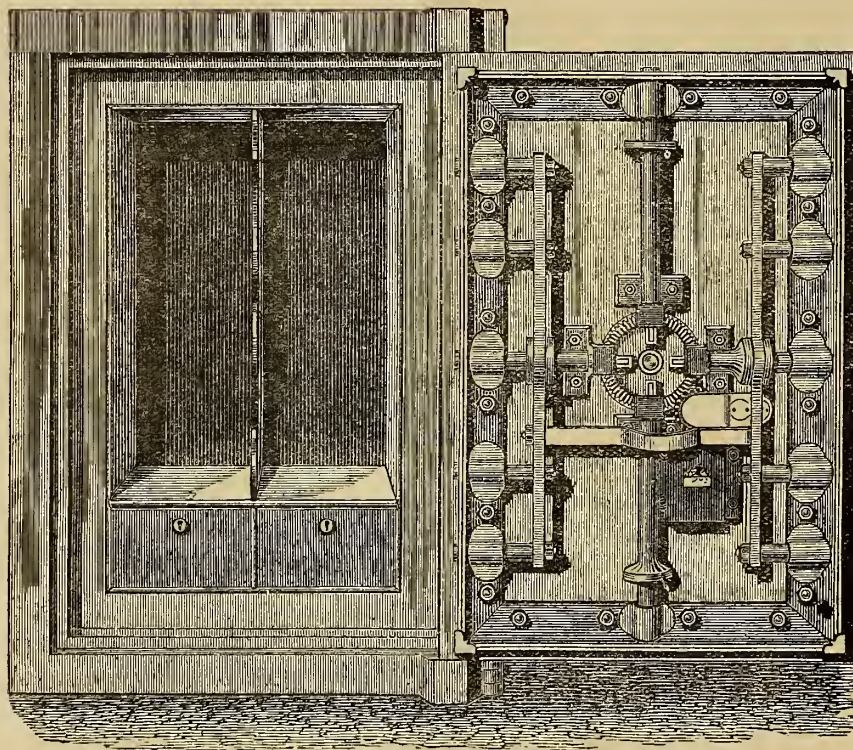
"A cap-case for your linen and your plate,
With a strange lock that opens with A.M.E.N."

Again,

"A lock
That goes with letters; for till every one be known,
The lock's as fast as if you had found none."

On an old letter-lock of the middle of the seventeenth century are the words "*Sorte aut labore*"—"by chance or labour"—which correctly describe their quality. The oldest locks that are known are those of the ancient Egyptians, with their wooden bolts and bronze pins. All these contrivances, no doubt, answered their purpose remarkably well; but, as mankind elevated thieving to the rank of a fine art, the inferior people, the lockers and safers, were bound to do something for their reputation in the opposite direction, and follow suit. Having now said a few words upon the ancient articles, we will come at once to our own days.

The first safe-maker on the new system was the late Mr. Marr, of London, and the fire-proof material was—well, he would never let any one into his workshop during filling time, and so that remained a secret from the general public. He first began to make in 1834, and had a prosperous run with that and his upright bolt "detector" lock for a number of years. We have often been in Marr's shop, and listened, with others, to his fervent eulogium



THE PATENT STEEL INTERSECTED SAFE.

whereby it was made very strong of its kind. The lock shot twelve bolts, not into the solid, but underneath a kind of rim that ran all round the inside of the box. So precious was this fastening considered that there was a false keyhole in the regular place—perhaps the greatest safety of all—whilst the true keyhole was concealed under a plate on the lid, opened by a secret spring; the lock itself was worth just a pick, three minutes, and the nimble fingers of a handy fellow! We pause for a moment to say that it seems a little singular that, in the days when violence was so prevalent among all classes of society, the "strong houses" should have been so very weak, whilst now, when every dirty crossing sweeper will cry out "police," if you rub closely against him, we should have arrived at such perfection in the art of, as the song says, "locking up our treasure."

But, furthermore, it is also not a little curious that for our first iron coffers we are indebted to the foreigner. Where is the foreigner in the art of safe-making now?

Then, with some of those chests and coffers we had puzzle locks, and dial locks, strong, but simple. As Beaumont and Fletcher say, in the "Noble Gentleman"—

upon his safes and their thief and fire resisting powers. Of course, we did not see the broken crockery between the iron slabs, which constituted his filling, nor had the now well-known "tentative" method of picking arrived, and we admired accordingly. But Marr and his safes and locks have passed away, and their simplicity is noted with a pitying smile, such as that generation bestowed upon the oak chests and iron-bound coffers of the preceding centuries.

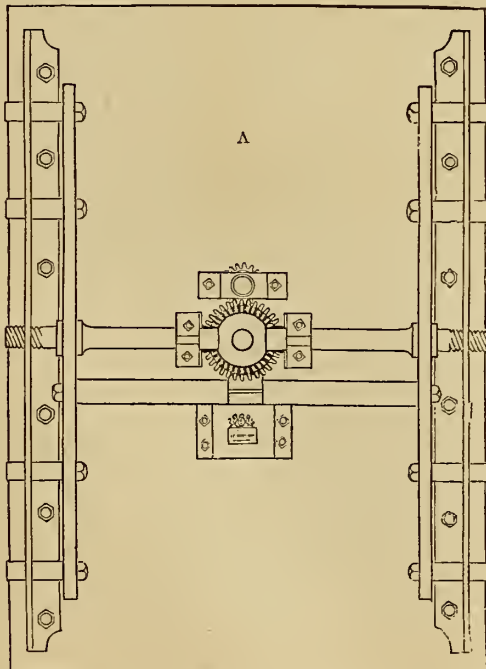
Being recently in the midland counties we made a flying visit to Stratford-on-Avon, and went to SHAKESPEARE'S HOUSE. Amid all that was interesting we saw, in an upstairs room, that marvellous picture of the immortal bard looking out from its place. We were not a little surprised to see, further, that it is recessed in a WHITFIELD'S fire-proof safe, the lady custodian informing us that the safe door closes upon it every night, and thoroughly protects it "against foes or wreck." This made an impression upon us, and soon after, reaching Birmingham, we made our way to the Viaduct Safe Works, Oxford-street, in that town, to which journey the reader is indebted for this paper.

Upon looking around us we directed our attention to the most prominent safes that we saw. Taking one of the class "for great

risks against fire and thieves," we naturally made some little examination and inquiry. We were informed that this quality of safe has "extra-strong" doors, made throughout of the best boiler-plate, the body is dove-tailed and strongly riveted together, in addition to which supports of strong angle-iron are riveted all round in the inside. It is "lined and filled with the patent evaporating composition, including the lock cases." This composition evolves moisture when the heat acting upon it reaches a certain point, and is ultimately converted into steam that permeates whatever other materials of non-conducting nature the safe may be lined with. The preserving temperature is the boiling point of 212 degrees Fahrenheit, in which paper will not burn. After looking at the "Impregnable Bullion Safe," we turned our attention to what may be called the typical model of the establishment. This was the Patent Steel Intersected Safe, having "the whole of the surface lined with drill-proof plates, and 1 inch solid thickness in the thinnest part, the front edge being $1\frac{3}{4}$ inch thick." These safes are also fitted with the fire-proof evaporating composition, which has been already mentioned.

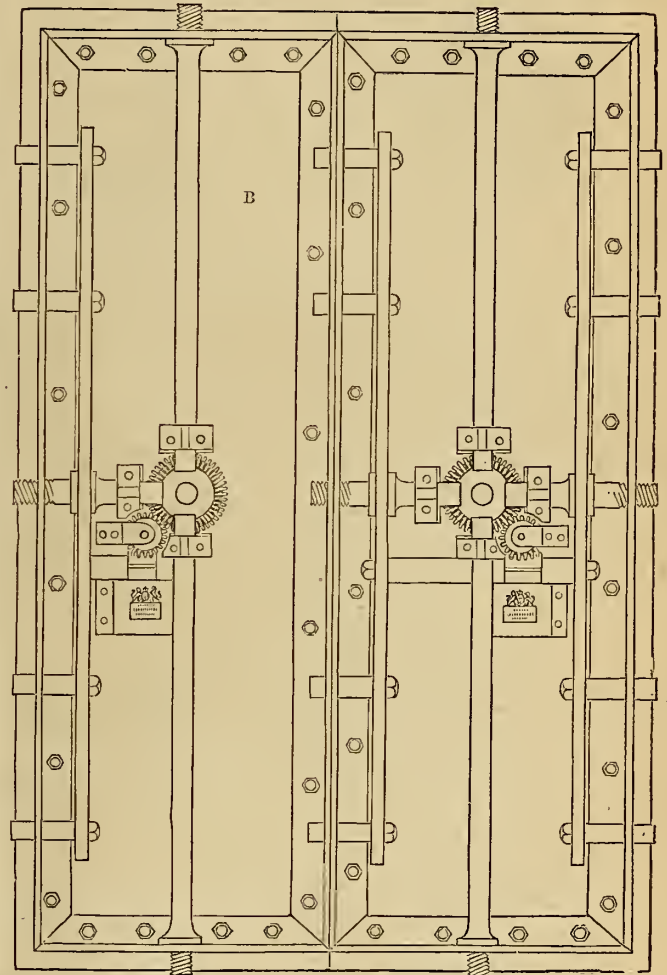
THE FASTENINGS.—The next, if not indeed the most important, in point of interest in a reliable safe is the fastening, which comprises the door, its mode of mounting, its bolting, and its locking. Towards invulnerability in this direction do all first-class safe-makers tend, and the details of their different principles are very interesting; it must be conceded, too, even by the sternest engineering critics, that a vast amount of mechanical ingenuity is developed at this point. We have before us illustrations of nearly every plan of fastening that is known as worth anything, for it must be remembered that the entrance to the citadel is generally looked upon as its weakest point. The method adopted in the safe under review, first going all round the joints, is this. The plates are, as we have just stated, strongly riveted to corresponding angle-irons in the inside; in addition to this, these plates are further dove-tailed, the tails projecting slightly above the surface of the plate. The object of this arrangement is, that, in the event of a prizing force being applied so as to compress the narrow part or neck of the dove-tail, in order to weaken its hold, the projection comes into use with its greater breadth than the mortise-cut—as a reversed edge, in fact—and can only be overcome by pulling the tail clean away. Of course it requires no engineering skill to know that to literally tear asunder 1 inch or $1\frac{3}{4}$ inch steel or iron dove-tails must require an enormous force.

We now come to the door. This is hung upon gauged centres and carriages, which are case-hardened to stand the constant friction to which such parts of all safe doors are subject. The fastening consists of a four-sided series of Whitfield's patent screw-bolts, and a "Whitfield's Mappin's Best Patent Twelve-slide Double-tier Lock," of which more presently.



The subjoined illustrations show these screw-bolts, the way in which they are fixed, and how they work. Their functions are to

frustrate the opening by means either of wedges, the "jemmy," or the well-known "Jack-in-the-box," or, in fact, by any other method. The bolts are shown here in the position they assume when shot into the safe frame, the lock-case and the fire-proof chamber having been removed in order to make them plainer to the reader. The outer line of the drawing shows the thick plate of the outside of the safe, the inside, where the bolt-heads are seen, being the locking hold-fast, which is to be found in every safe of any pretension to quality. It will be seen that the screw-bolts not only pass through the lock-case, but into this outside thick plate, the bar-frame carrying the bolts is moved by bevelled wheel-work, and the central bolts, as will be seen, have screw-ends of 1 inch in diameter, with a deep thread upon

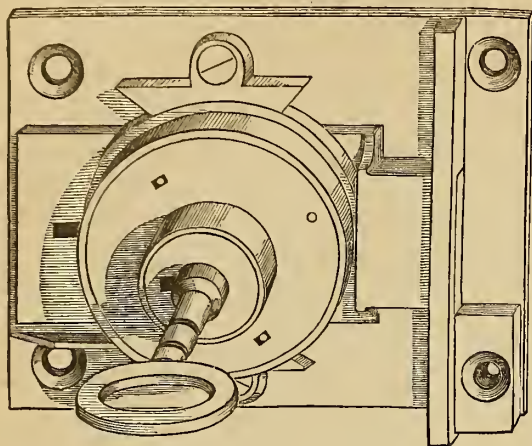


them; they go into similarly tapped hollow screw-holes by motion-work from the outside. Their purpose, in addition to the plain bolts, is to prevent pressure, as it is quite clear that, to force the bolts inwards, the threads of the screws must be stripped and the bevelled gearing broken away. The testimony of civil engineers of position was placed before us as to the high security afforded by these screw-bolts. When the bolts are fixed, the lock-bolt is thrown up between two tail-pieces on the cross-heads that carry the bolts; this lock-bolt has a toothed end, which firmly locks up the wheel-work as well as the fastening bolts. It may be added that the screwing-winch which turns the wheels from the outside is quite useless after the locking-bolt has been thrown between the tail-pieces of the cross-heads before-mentioned. Fig. A is a single door, and Fig. B is a double door.

In the single door the place of the bolts is easily understood, whilst in the double door the set of bolts on the closing side of the right-hand half screws into the left-hand, making practically one door of the two halves. As a further strengthening, however, each half has independent top and bottom screw-bolts of its own.

One of the special advantages in these screw-bolts is the fact of their adding greatly to the strength and security of the safe. The entire bolt work is securely fixed to the main plate of the door, and not to the lock cases, as we have frequently noticed in ordinary safes.

We have now, we hope, made the principle of the safe easy to be understood by the non-technical reader, and we will now pass on to the characteristics of the Lock.



MAPPIN'S IMPROVED GUNPOWDER-PROOF LOCK (FIG. 1)

claims the following excellences:—It cannot be picked, nor opened by violence, nor blown off with gunpowder; the keys cannot be copied; and the works are not liable to derangement. "What more," it may be asked, "do you want in a lock than that?" We will place the lock fairly before our readers and let them form their own opinion. Fig. 1 is a drawing of the lock itself, at about two-thirds the actual size; the barrel containing the works being concealed when the lock is fixed on. Fig. 2 shows the sliders in the interior of the barrel, or cylinder, on plan. A is a strong cylinder of brass; B is also a brass cylinder fitting

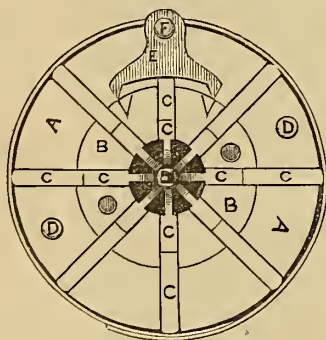
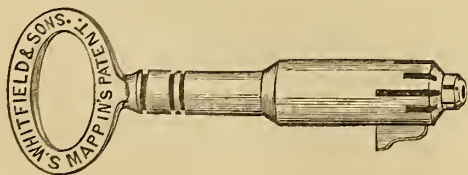


FIG. 2.

accurately into A. These two cylinders have twelve radial grooves, eight on the top and four on the under side; the grooves of the outer cylinder being a prolongation of those of the inner one. C C C C are steel sliders fitted in these grooves; the under ones cannot be seen. E is a double-action lever detector studded at F. The next is the key, which need not be "figured." The reader will see the grooves in it at the locking end. In order to make the matter as plain as we can, we will call these grooves "scoop grooves;" that is, that the cut or "scoop" begins at the surface of the key, and goes gradually down to a certain depth. No two grooves are either of the same length or the same depth, so that if one could be gauged surreptitiously it would not be of the



slightest use for a false key, as no other groove would be like it. We bespeak attention to this peculiar formation of the key; the small "bit" on the under side is for the purpose of moving the bolt, and

is twinned, that is, cut into two halves, grooved for a slider. Fig. 3 is a view of the cylinder and sliders with the key in. Now, the

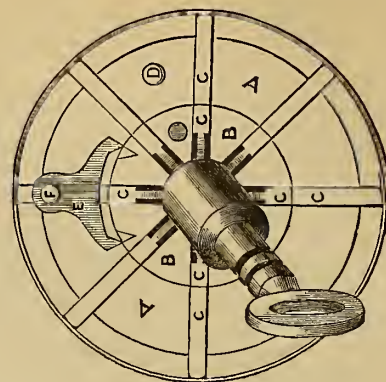


FIG. 3.

action of unlocking is this:—The key is pushed into the lock, each groove taking in the end of its own slider. As the key presses onward its grooves become shallower, and the key-shank thickens there. Consequently the sliders are pushed outward all round in their grooves to a certain distance. This distance is exactly where the divisions in the sliders correspond with the joints, where the inner cylinder B fits into the outer cylinder A. When that occurs the key can turn the inner cylinder, and by it the bolt. Should any of the sliders be either forced not far enough or too far, and the bolt be pressed upon, the triangular detector at the top comes into play. Suppose that a pick or false key were tried; then the outer cylinder would move a little with the attempt to pass the bolt, which movement would bring down a pallet, or tooth, of the detector into one of the notches on the inner cylinder, and hold all fast. In this position it can only be released by taking the false key out, and applying the true one a little the reverse way, when the unlocking may be effected.

The outer circular line of the above figures represents a broad steel spring which holds all the sliders in their proper places.

Such is a description, as well as we have been able to convey it, of Mappin's lock. The double set of sliders are certainly a great security, and, if picking is not impossible, must render that operation very difficult. The keyhole is too small for gunpowder; and we have no hesitation in affirming that keys on this principle cannot be "impressed," or copied, the scoop-formation of the grooves entirely prohibiting that rascality.

We have now, we think, placed both lock and safe in a fair position for the judgment of our readers, and we cannot do better than conclude in the words of one of the firm which were addressed to us upon leaving the works—"We do not pretend to work miracles; but we honestly think that we can make as good locks and safes as anybody else."

Referring to the position of these safes in the market, it may be mentioned that many thousands of them are in use protecting valuable property in all parts of the world, and we are informed that, notwithstanding the many attempts which have been made to pick one of their locks, none have yet succeeded, and that they have in numerous instances successfully resisted protracted fires and attempts of burglars.

In reference to the fire-resisting qualities of these safes, we find that, as far back as May, 1854, the following account of a severe test was given in the *Birmingham Journal*:—

"On Thursday, some rather interesting experiments were made upon a piece of land beneath the viaduct of the Great Western Railway, in Oxford-street. The object was to test the fire-proof safes of Mr. Samuel Whitfield, whose works are situated in that locality. Two safes were selected, the one a "holdfast safe," and the other a "fire-resisting 32-inch banker's safe." Many gentlemen were present who seemed to take a deep interest in the progress of the experiments. In the banker's safe were deposited books, loose papers, and parchments; it was then locked, the keys given into the possession of a gentleman present, and the fire kindled at twenty minutes past eleven. The second safe, which also contained books and papers, was placed in the fire at twenty minutes past twelve; and the two fires were kept up with great vigour during the test, a cartload of timber and half a ton of coal having been consumed. At three o'clock the holdfast safe, having been exposed to intense heat for two hours and forty minutes, was withdrawn from the fire and opened; all the contents were found perfect, except that the

covers of some of the books were slightly injured, otherwise the papers were untouched by the intense heat to which they had been exposed. The fire was still kept up round the bankers' safe, a great portion of the outside of which was red-hot for a considerable time, as may readily be imagined when we state that the flame from a quantity of dry wood and a good supply of coal formed a fire upwards of eight feet in diameter around it, and made the place so intensely hot that the spectators could scarcely approach the spot. Shortly before four o'clock preparations were made for opening this safe; when withdrawn from the fire, and somewhat cooled, it was unlocked, the keys performing this work without difficulty, and, somewhat to the astonishment of many, the contents were found perfectly safe and uninjured, exhibiting only a slight degree of dampness. This was considered the more extraordinary, inasmuch as the outer plates and the lock-case were very much burnt and altered in shape from the action of the fire. So satisfactory were the experiments considered, that certificates were given by the gentlemen present, some of whom expressed an opinion that it was almost impossible that any iron safe could accidentally be subjected to so severe a test, and that the trial throughout had been conducted with perfect fairness."

REGISTRATION OF TRADE MARKS.

WE strongly advise our readers to lose no time in making application for registry of their Trade Marks under the provisions of the new Act, which came into force on 1st of January last. We shall be happy to advise upon any points, and to carry out the formalities of registration for those of our friends who are desirous of saving the heavy fees demanded by some patent agents. All communications to be addressed to the Editor, "Watchmaker, Jeweller, and Silversmith," 34, Hatton Garden, London, marked on the outside "Trade Marks."

THE EXHIBITION OF SCIENTIFIC APPARATUS.

THE Exhibition of Scientific Apparatus, to be held at South Kensington in April next, is being well supported. Her Majesty's Commissioners for the Exhibition of 1851 have lent their western galleries in Prince Albert's-road, and committees have been, and are still being, formed in many important countries for the purpose of collecting instruments for the three departments of the Exhibition, viz., the historical, the educational, and the experimental. In Berlin the committee have published an invitation, in which they say, "Science being the common property of all nations, the Exhibition of the appliances by which it is promoted partakes of an international character. The objects pursued by the English commission in organizing the Exhibition have in Germany also been recognized as worthy of attainment, and, in order to give an impulse in our Fatherland to German participation in the Exhibition a committee has been formed at the special instance of the Crown Prince and Princess of Germany, which has been entrusted by the English commission with the collection and selection of objects worthy of being exhibited."

The Exhibition will consist of instruments and apparatus employed for research, and other scientific purposes, and for teaching. It will also include apparatus illustrative of the progress of science, and its applications to the arts, as well as such as may possess special interest on account of the persons by whom, or the investigations in which, it had been employed. Models, drawings, or photographs will also be admissible where the originals cannot be sent.

The apparatus may, in certain cases, be arranged in train as used for typical investigations. And arrangements will be made, as far as it may be found practicable, for systematically explaining and illustrating the use of the apparatus in the various sections.

The cost of carriage of all objects selected for exhibition will be defrayed by the Science and Art Department.

Forms on which to enter descriptions of objects offered for exhibition may be obtained on application to the Director of the South Kensington Museum, London, S.W.

The Exhibition will open on the 1st April, 1876, and will remain open until the end of September, after which time the objects will be returned to the owners.

AN ACCOUNT of the declared Real VALUE of the IMPORTS and EXPORTS of GOLD and SILVER BULLION and SPECIE Registered in the Month ended 31st December, 1875, and in the Twelve Months ended 31st December, 1875, compared with the corresponding Periods in the Year 1874.

GOLD.

SILVER.

COUNTRIES.	IMPORTS.				EXPORTS.				IMPORTS.				EXPORTS.			
	Month ended 31st December.		Twelve months ended 31st December.		Month ended 31st December.		Twelve months ended 31st December.		Month ended 31st December.		Twelve months ended 31st December.		Month ended 31st December.		Twelve months ended 31st December.	
	1874.	1875.	1874.	1875.	1874.	1875.	1874.	1875.	1874.	1875.	1874.	1875.	1874.	1875.	1874.	1875.
RUSSIA ...	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
GERMANY ...	27,000	700	47,600	...	...	1,013,120	132,000	6,405,737	604,550	184,290	2,351,968	1,152,523	20,000	...	742,740	1,000
HOLLAND ...	81	100	85,106	409,098	...	8,000	478,026	1,078,945	1,029	100	156,060	8,498	10,258	...	117,088	101,696
BELGIUM ...	14,660	124,440	186,114	284,244	4,000	118,840	527,200	1,202,124	2,386	4,302	262,758	65,099	61,850	9,040	212,003	192,622
FRANCE ...	79,801	91,021	740,395	2,022,964	267,220	1,879,106	5,433,712	5,341,074	211,682	110,303	1,172,272	1,392,305	277,084	415,175	1,321,658	2,424,210
PORTUGAL ...	...	...	132	2,490	54,120	800	354,872	607,120	3,337	985	17,651	13,925	1,295	945	12,352	6,337
MADEIRA ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SPAIN and CANARIES ...	1,130	...	4,085	2,571	1,020	...	3,752	591,033	59	50	539	1,062	77,500	262,000	1,882,312	1,679,030
GIBRALTAR ...	9,286	15,177	75,702	114,665	...	...	...	25,000	8,895	3,903	58,224	33,317	...	...	...	10,000
MALTA ...	4,130	6,444	40,628	128,027	40,000	...	70,000	45,600	100	862	3,590	11,584	...	4,000	...	9,271
TURKEY ...	...	588	10,302	2,306	...	...	...	...	...	40	50	334	...	...	...	22,000
EGYPT ...	...	20,000	223,250	526,359	21,118	55,000	910,663	65,100	1,450	220	21,885	14,207	940,965	...	*6,683,456	30
WEST COAST OF AFRICA ...	7,841	5,244	136,263	117,321	175	...	35,070	14,029	3,993	646	40,964	23,587	2,805	1,955	73,817	28,526
BRITISH POSSESSIONS IN SOUTH AFRICA ...	21,535	51,318	306,695	244,034	...	...	10,583	...	60	1,120	13,317	11,775	...	...	21,200	15,275
BRITISH INDIA ...	...	20,050	265,135	91,405	...	11,086	...	77,722	...	...	17,858	122,157	...	159,150	...	3,231,266
CHINA (including HONG KONG) ...	9,450	63,161	282,586	341,669	...	...	...	...	39,802	12,444	371,741	112,730	...	23,080	24,800	833,131
AUSTRALIA ...	876,177	377,418	6,720,877	6,640,881	...	10,500	...	20,500	3,886	300	21,250	33,061	...	875	20,595	13,825
BRITISH NORTH AMERICA ...	...	4	2,479	4,004	...	...	16,000	80,000	3,900	1,112	17,150	843	...	...	8,000	1,050
MEXICO ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
SOUTH AMERICA (Except Brazil & West Indies) ...	118,304	139,125	2,491,828	1,386,300	35,250	40,277	1,375,960	983,109	218,906	258,414	3,931,823	3,362,666	300	1,515	107,560	57,354
BRAZIL ...	240	5,741	371,584	257,415	1,000	49,625	500,767	977,697	...	17,724	61,493	68,877	...	...	25	...
UNITED STATES ...	1,136,622	6,604	4,508,740	8,257,664	...	...	9,095	576,659	269,723	301,081	3,477,322	3,181,227	...	...	25,250	89,280
OTHER COUNTRIES ...	274,759	280,241	1,570,833	2,261,404	...	5,100	783,936	718,977	3,656	9,191	297,254	506,591	100	...	324,546	38,060
Total Value of £	2,581,016	1,207,376	18,081,019	23,100,834	423,903	3,191,454	10,641,636	18,810,426	1,377,405	907,787	12,298,169	10,123,955	1,392,157	877,735	12,211,937	8,906,726

* Bullion, chiefly for India, £6,683,431.
Coin, " China, £25.

THE Watchmaker, Jeweller, and Silversmith,

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Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades; published at 34, HATTON GARDEN, LONDON, E.C.

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PATENTS.

Notices to Proceed.

4333. MARIUS ANTHONY PRADIER, of 7, Bedford Street, Bedford Square, in the county of Middlesex, Manufacturing Jeweller, has given the like notice in respect of the invention of "A new and improved method of fastening and unfastening the shirt, collar, or other stud, sleeve-link, and solitaire, by means of the screw principle."
3211. JAMES MILWARD HOLMES, of Birmingham, in the county of Warwick, Secretary of the International Agency, has given notice in respect of the invention of "A new or improved machine or apparatus for compressing scrap metal, metallic filings, and other metallic waste, preparatory to remelting the same."—A communication to him from abroad by Lewis J. Atwood, of Waterbury, Connecticut, in the United States of America.
4552. HENRY BESSEMER, of Denmark Hill, in the county of Surrey, has given the like notice in respect of the invention of "Improvements in the manufacture of reflectors, lenses, and optical glasses, and also in machinery, tools, and apparatus employed in manufacturing and mounting the same."

Patents Sealed.

2513. LINUS ORTON THAYER, of Montreal, Canada, and of 1, Leadenhall Street, E.C., city of London, Doctor of Medicine, for an invention of "Improvements in compounds for dental plates and other purposes, such as jewellery, artificial coral, buttons, and other similar articles."—A communication to him from abroad by Volney Smith, of Schenectady, New York, United States of America.—Dated 13th July, 1875.
2921. JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, in the county of Middlesex, Gentleman, for the invention of "Improvements in electric clocks or clock-work."—A communication to him from abroad by Emile Joanni Gondolo, of Paris, in the republic of France.—Dated 19th August, 1875.
3469. JAMES RAY HOSMER, of 63, Queen Victoria Street (Metropolitan Buildings), county of Middlesex, London, for an invention of "Improvements in portable fire-proof safes, and in wardrobes and fire-proof closets for buildings."—A communication to him from abroad by William Albert Shepard, of the city of New York.

Grants of Provisional Patents for Six Months.

4292. To WILLIAM JACKSON, of Birmingham, in the county of Warwick, Jeweller, for the invention of "Improvements in lockets, brooches, bracelets, and other like ornaments and ornamental fastenings."
4498. To JUAN NEPOMUCENO ADORNO, of Harley Street, Cavendish Square, the county of Middlesex, Gentleman, for the invention of "Improvements in watches and clocks."

Patents which have become Void.

165. EDWARD HIPKINS, of Kate's Hill, in the parish of Dudley and county of Worcester, Iron Safe Manufacturer, for an invention of "Improvements in iron safes."—Dated 15th January, 1873.
173. CHARLES ELNES PARKER RHODES, of 27, Somerleyton Road, Brixton, in the county of Surrey, Esquire, late of H.M. Consular Service, for an invention of "An improved mode and means for illuminating clocks and other similar articles."—Dated 16th January, 1873.

Patents Granted in Foreign States.

FRANCE.

- 108,574. THIERY, for "Improvements in machines for manufacturing watch cases and other like articles."—Dated 25th June, 1875.
- 108,251. FUNEY, sen. and jun., of Foucine-le-Haut, for "A bell-hammer for public clocks."—Dated 8th June, 1875.
- 108,269. RECORDON and DIDIER, for "Electric luminous dials for clocks and watches."—Dated 8th June, 1875.

BELGIUM.

- 38,397. A. J. F. BERTRAND, for an important invention of "An index for the prime mover of watches."—Dated 9th December, 1875.—(French Patent, 18th November, 1875.)

UNITED STATES.

- 169,940. W. W. ALDEN, of Providence, R.I., for "Braided jewellery."—Application filed 29th March, 1875.
- 169,987. CHAS. D. P. GIBSON, of New York, N.Y., for "Stem-winding watches."—Application filed 3rd March, 1875.
- 170,076. JOSEPH GELBRECHT, of Cincinnati, Ohio, assignor to Geo. Doerr, of the same place, for "Dies for making watch-case centres."—Application filed 25th September, 1875.
3942. WILLIAM EHRLHARDT, of Birmingham, in the county of Warwick, Chronometer and Watch Manufacturer, for an invention of "Improvements in watches."—Dated 24th December, 1868.
- 173,341. ANSEL S. BUCKELEW, of Colusa, Cal., for "Watch-case springs."—Application filed 18th September, 1875.
- 170,443. WM. IMHAEUSER of Brooklyn, N.Y., for "Watchmen's time-detectors."—Application filed 14th August, 1875.—*Brief*.—"To guard against dishonest watchmen who open the case and mark the dial without going their rounds. Provides the time-detector with an additional marker, which marks the dial whenever the case is opened."
- 170,553. LEWIS A. HAINES, of Westminster, Md., for "Time-locks."—Application filed 16th October, 1875.—*Brief*.—"Two graduated dials actuated by time mechanism, and having notches in their peripheries, which will, at the proper time, release a weighted arm, and allow the bolts to be unlocked by the turning of a cam-plate. An auxiliary graduated dial, having a groove and notch in its face, combined with a gravitating-arm having a pin on one end adapted to enter the groove in said dial, and a hooked extension on its pivoted end, which, with a stud on spring cam-plate, will hold the bolts unlocked, and, at the expiration of a given time, will release the said stud, and allow the bolts to be locked by the recoil of the cam-plate."
- 170,558. PATK. B. HENNESSY, of Hamilton, Canada, for "Time-locks."—Application filed 24th August, 1875.
- 170,625. ROBERT M. FRYER, of New York, N.Y., assignor to the Fryer Noble Metal-Mining Company of New York, for "Apparatus for roasting gold and silver ores."—Application filed 20th May, 1875.
- 170,644. JOHN W. STEWART, of Woodville, Tex., assignor of two-thirds of his right to James K. Durham and John N. Goolsbee, for "Spectacle-frames."—Application filed 15th July, 1875.
- 170,212. J. WALLACE, Keokuk, of Iowa, for "Geographical Clocks."
- 170,344. ANSEL S. BUCKELEW, of Colusa, Cal., for "Watch-case springs."
- 170,423. MARSHALL WHEELER, of Big Rapids, Mich., for "Solar chronometers."
- 171,035. A. MONNIER, of Sacramento, Cal., for "Watch-cleaning fluids."—Application filed 27th August, 1875.—*Claim*.—"The compound herein described for cleansing watches, jewellery, and other articles, consisting of distilled water, pure castile-soap, and cyanide of potassium, the proportions being substantially as herein described."
- 171,058. FRANK E. SMITH, of San Jose, Cal., for "Reversible centre-pinions for watches."—Application filed 7th July, 1875.
- 171,098. ELIJAH CLARK, of Paris, Ky., for "Electric clocks."—Application filed 23rd April, 1875.—*Brief*.—"Armature-lever, forked, and used as escapement-lever. Balance-wheel controls circuit."

GRAND DUCHY OF BADEN.—ISSUES AND RE-ISSUES.

27. TIFFANY and Co., of Geneva, for "An anchor-escapement with a double disc."—3 years.—Dated 23rd March, 1875.
28. A HEBERLE, of Ueberlingen, for "A simple construction of Dutch clocks."—3 years.—Dated 1st April, 1875.
70. E. FARCOI, of Paris, for "An Apparatus for winding wall-clocks."—3 years.—Dated 5th July, 1875.
120. J. H. MARTENS, of Freiburg, for "A chronometer escapement."—3 years.—14th November, 1875.
26. F. W. WARSCHAU, of Wippa-on-the-Harz, for "A chronometer lever escapement for second-watches."—3 years.—Dated 30 December, 1875.

Designs Patented in United States.

- 8811 and 8812. THOMAS G. BROWN, of Newark, N.J., for "Sleeve-buttons and studs."—Applications filed 6th November, 1875.—Term of patents $3\frac{1}{2}$ years.—Cases A and B.
- 8813 to 8815, inclusive. JOSEPH LEHNBEUTER and CASPAR CLAES, of St. Louis, Mo., for "Sbow-cases."—Applications filed 22nd July, 1875.—Term of patents, 7 years.—Cases A, B, C.

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FEBRUARY, 1876.

STATIONS.	FROM LONDON.—WEEK DAYS.										SUNDAYS.		PULLMAN DRAWING ROOM AND SLEEPING CARS.	DOWN TRAINS—WEEK DAYS.
	a.m. Fast.	a.m. Fast.	a.m. Exp.	a.m. Exp.	p.m. Fast.	p.m. Exp.	p.m. Exp.	p.m. Mail.	p.m. Exp.	p.m. Fast.	p.m. Mail.			
Victoria (L. C. & D.) dep.		7 50	8 48	10 55	2 0	2 50	3 55	7 42	11 0	1 35	7 35	The Celebrated American Pullman Drawing Room and Sleeping Cars, now run regularly by the undermentioned Trains on the Midland Railway.	PULLMAN DRAWING ROOM AND SLEEPING CARS.	10. 0 a.m. London (St. Pancras) to Manchester (Drawing Room Car). 4. 0 p.m. London (St. Pancras) to Liverpool and Manchester (Drawing Room and Ordinary Cars to Marple and Liverpool, and Ordinary Cars to Manchester). 12. 0 midnight, London (St. Pancras) to Leeds, and Bradford (Drawing Room, Sleeping, and Ordinary Cars to Bradford, and Sleeping Car only to Liverpool).
Ludgate Hill ... "	.....	8 38	9 24	11 28	2 32	3 25	4 32	8 18	11 35	2 10	8 10			
Moorgate Street ... "	.....	8 40	9 37	11 25	2 43	3 35	4 40	8 27	11 40	2 26	8 23			
St. Pancras ... "	.....	5 15	8 55	10 0	11 45	3 0	4 0	5 0	8 50	12 0	5 50			
Leicester ... arr.	7 24	11 39	12 17	2 20	5 27	6 19	7 21	11 29	2 23	5 24	11 29			
Nottingham ... "	8 14	12 35	1 10	3 25	6 15	7 10	8 13	12 25	3 15	6 20	12 25			
Derby ... "	8 18	12 40	1 10	3 23	6 27	7 9	8 15	12 24	3 14	6 20	12 24			
Manchester ... "	10 0	.....	3 0	5 5	8 10	8 45	10 0	.....	5 10	8 0	.....			
Liverpool (Central) ... "	11 15	.....	3 50	6 5	9 0	9 40	11 25	.....	5 0	8 50	.....			
Sheffield ... "	9 27	1 18	1 55	4 11	7 45	.....	9 0	1 43	4 18	8 25	1 43			
Leeds ... "	10 45	2 35	3 0	5 35	9 5	.....	10 10	3 0	5 20	10 2	3 0			
Bradford ... "	11 35	.....	3 25	6 15	10 10	.....	10 35	3 55	5 45	11 20	3 55			

STATIONS.	TO LONDON.—WEEK DAYS.										SUNDAYS.		PULLMAN DRAWING ROOM AND SLEEPING CARS.	UP TRAINS—WEEK DAYS.	
	a.m. Mail.	a.m. Exp.	a.m. Exp.	a.m. Exp.	a.m. Exp.	a.m. Fast.	p.m. Fast.	p.m. Exp.	p.m. Fast.	p.m. Mail.	p.m. Fast.	p.m. Mail.			
Bradford ... dep.	...	...	9 20	...	9 30	11 55	2 15	4 20	5 0	9 15	1 2	8 45	The Celebrated American Pullman Drawing Room and Sleeping Cars, now run regularly by the undermentioned Trains on the Midland Railway.	PULLMAN DRAWING ROOM AND SLEEPING CARS.	9.20 a.m. Bradford to London (Drawing Room and Ordinary Cars). 10.30 a.m. Bradford to London (Drawing Room and Ordinary Cars). 11.10 a.m. Manchester to London (Drawing Room and Ordinary Cars from Liverpool, and Ordinary Cars from Manchester). 4.50 p.m. Manchester to London (Drawing Room, Sleeping, and Ordinary Cars). 9.45 p.m. Liverpool to London (Sleeping Car). 12.15 p.m. Bradford to London (Sleeping Car).
Leeds ... "	2 40	...	9 45	...	10 35	12 50	2 45	4 45	5 40	10 5	2 15	10 5			
Sheffield ... "	4 12	7 55	10 39	...	12 5	2 20	4 0	5 55	6 58	11 26	4 17	11 26			
Liverpool (Central) ... "	...	...	...	9 0	10 30	12 0	2 35	4 0	...	9 45	4 0	...			
Manchester ... "	...	7 0	...	9 50	11 10	1 0	3 35	4 50	...	10 35	4 50	...			
Derby ... "	6 15	8 38	10 20	11 35	12 56	3 10	5 15	6 45	...	1 0	6 33	1 0			
Nottingham ... "	6 15	8 40	11 15	11 35	12 55	3 15	5 15	6 45	7 45	12 55	6 35	12 55			
Leicester ... "	7 25	9 32	12 5	12 30	1 46	4 9	6 8	7 40	8 50	2 4	7 28	2 4			
St. Pancras ... arr.	10 30	12 0	2 20	2 55	4 5	6 43	8 40	10 0	11 35	4 45	10 25	4 45			
Moorgate Street.. "	10 46	12 14	2 35	3 8	4 26	6 57	8 57	10 13	...	...	...	...			
Ludgate Hill ... "	10 56	12 35	2 54	3 32	4 36	7 19	9 2	10 24	...	...	...	...			
Victoria (L. C. & D.) ... "	11 29	1 7	3 30	4 7	5 12	7 56	9 37	11 9	...	...	...	...			

STATIONS.	TO LONDON.—WEEK DAYS.										SUNDAYS.		PULLMAN DRAWING ROOM AND SLEEPING CARS. The Celebrated American Pullman Drawing Room and Sleeping Cars, now run regularly by the undermentioned trains on the Midland Railway.	UP TRAINS—WEEK DAYS. 9.20 a.m. Bradford to London (Drawing Room and Ordinary Cars). 10.30 a.m. Liverpool, and 11.10 a.m. Manchester to London (Drawing Room and Ordinary Cars from Manchester). 4.50 p.m. Manchester to London (Drawing Room Car). 9.45 p.m. Liverpool to London (Sleeping Car). 5.15 p.m. Bradford to London (Sleeping Car).
	a.m. Mail.	a.m. Exp.	a.m. Exp.	a.m. Exp.	a.m. Exp.	a.m. Fast.	p.m. Past.	p.m. Exp.	p.m. Fast.	p.m. Mail.	p.m. Past.	p.m. Mail.		
Bradford ... dep.	...	...	9 20	...	9 30	11 55	2 15	4 20	5 0	9 15	1 20	8 45		
Leeds "	2 40	...	9 45	...	10 35	12 50	2 45	4 45	5 40	10 5	2 15	10 5		
Sheffield "	4 12	7 55	10 39	...	12 5	2 20	4 0	5 55	6 58	11 26	4 17	11 26		
Liverpool (Central) ... "	...	...	...	9 0	10 30	12 0	2 35	4 0	...	9 45	4 0	...		
Manchester "	...	7 0	...	9 50	11 10	1 0	3 35	4 50	...	10 35	4 50	...		
Derby "	6 15	8 38	10 20	11 35	12 56	3 10	5 15	6 45	...	1 0	6 33	1 0		
Nottingham "	6 15	8 40	11 15	11 35	12 55	3 15	5 15	6 45	7 45	12 55	6 35	12 55		
Leicester "	7 25	9 32	12 5	12 30	1 46	4 9	6 8	7 40	8 50	2 4	7 28	2 4		
St. Pancras arr.	10 30	12 0	2 20	2 55	4 5	6 43	8 40	10 0	11 35	4 45	10 25	4 45		
Moorgate Street.. .. "	10 46	12 14	2 35	3 8	4 26	6 57	8 57	10 13	...	...	...	...		
Ludgate Hill "	10 56	12 35	2 54	3 32	4 36	7 19	9 2	10 24	...	...	...	...		
Victoria (L. C. & D.) ..	11 29	1 7	3 30	4 7	5 12	7 56	9 37	11 9	...	...	...	...		

Derby, 1876.

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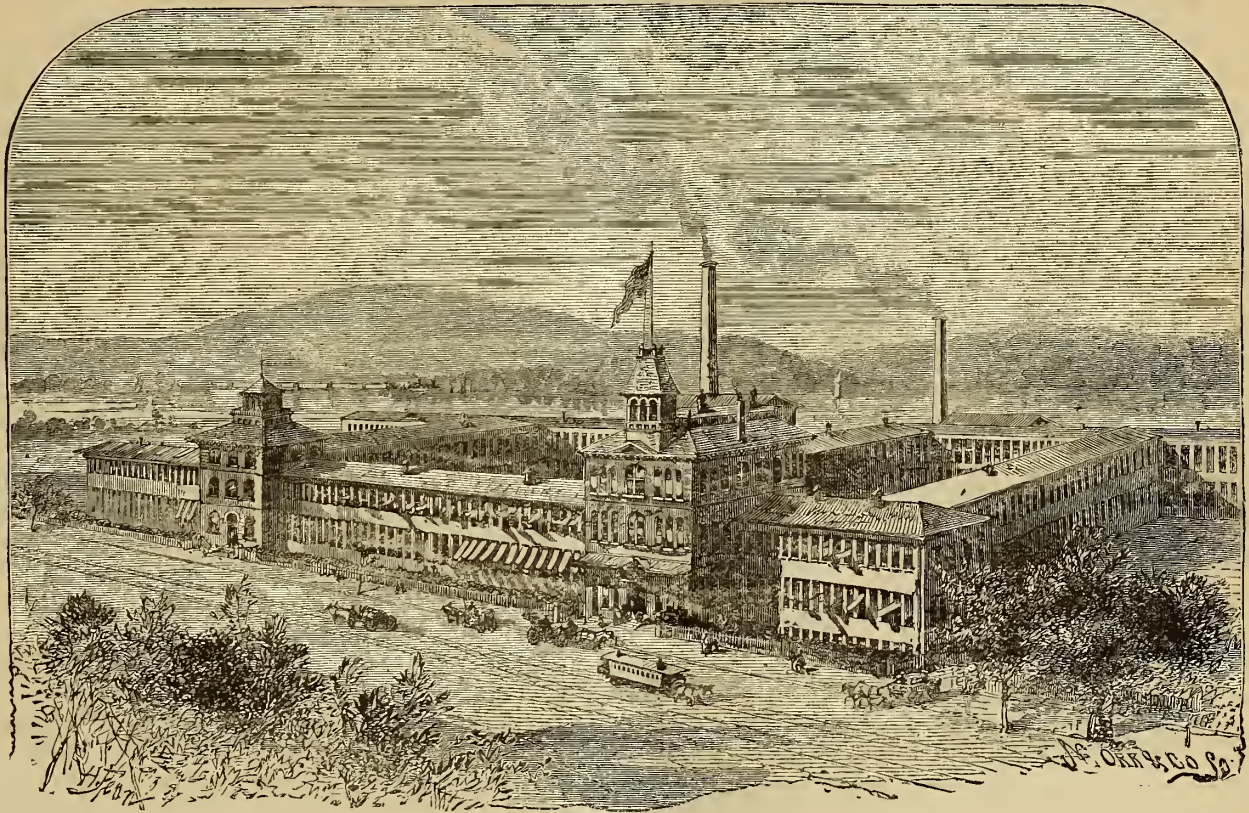
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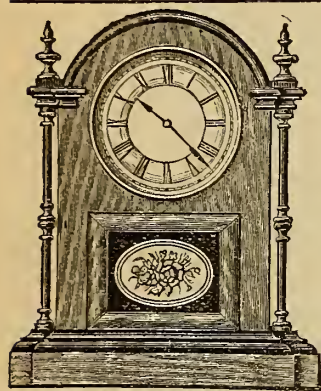
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HOROLOGY.

(Continued.)

X.—DIALLING.*

WE now change our point of the compass and turn eastwards. It may be said that that is what we ought to have done at first; follow the example of every-day life and have begun with east, then to west, north, and south. In dialling, however, matters at times run the other way, so that one is not always quite free to do as he chooses. Besides, our editor is a genius of very "pronounced" temperature at times, and we do not like to see good books flying about the room as if in search of a pair of eyes to read them. As most of our readers may probably understand what *that* means, we will dispense with any further explanation and go on.

An east dial is that one that is drawn, as its name indicates, on the plane of the meridian looking towards the east. It must be remembered that, as the sun only shines on such a dial from the time of rising until noon, it is "dead" after twelve o'clock. Still, for early risers such a dial has its advantages; and, as there are plenty of up-with-the-lark folks left in the land, we will describe how to construct such a dial.

On the eastern side of the plane of the meridian draw a right line, which we will call A B, parallel to the horizon. As a hypotenuse to this, and as one intended to pass through the

centre of the dial, draw another, and call it A K. We have now an angle A K B, which is equal to the elevation of the equator. On the upper part of the hypotenuse describe a circle, and cut this circle in two by a line at right angles to the oblique line above-named; this line we will call E C. Being perpendicular to the hypotenuse it will divide the circle into four equal parts, or quadrants. Now, subdivide each of these quadrants into six equal parts. From the centre of the circle, through the points of the quadrant subdivisions, draw right lines to the edge of the dial-plate. From the extremities of these last lines draw others at right angles to the line A K; the intersection of these last two will be the points at which the hour lines will have to be marked. What, for the purpose of plainness, we will call the "cross" lines will be marked, commencing with the uppermost one as 4, 5, 6, 7, 8, 9, 10, 11, whilst the line K A will be 12, or noon. Erect a style equal to the radius of the circle, perpendicular to the plane, or on two supports at E and C place an iron rod equal to the semidiameter of the circle, and this rod will indicate the hours of both sides, if they are so marked. So much for an east dial. We will now deal with the other half of this part of the question, and go westward.

A west, or erect direct west dial, as may be understood, is one constructed for the western side of the meridian. The difference here is, that whilst the sun only illumines the eastern dial from sunrise to noon, he shines upon the western dial from noon until sunset. From this it will be easily seen that an eastern and western dial joined together will show all the hours of the day. For such a purpose they are frequently so joined. The construction of a western dial is exactly that of an eastern one in principle; in practice all the details are reversed, and in the inverted condition the hours are accordingly written.

* By an oversight the article in the February number was marked VIII. It should have been IX. as the previous article was VIII.

Following in our order we come to the north again; this time to the polar part of it. A polar dial is one described on a plane passing through the polar axis of the earth, which plane also passes through the east and west points of the horizon. This description of dial is divided into two kinds; the first looks upwards towards the sky, whilst the second has, to a certain extent, an opposite aspect. As the name indicates, the polar dial is inclined to the horizon in an angle equal to the elevation of the earth's pole. A description of it will require some little attention.

First of all draw a circle of any dimensions, and across make a horizontal diameter, which we will call H R. Then draw the polar axis, which will be at an angle of 45 degrees from the perpendicular of H R; or, in other words, at one half of the quadrant between H and the perpendicular named. The next thing is to draw an ellipse on the horizontal line to represent that plane, and another on the polar axis to represent that plane. The polar plane will pass through, or cut the horizontal one in two places, and, by doing so, intercept a quadrant of the equator between the said polar plane and the meridian. Now the consequence is this: the upper surface is illumined by the sun from six o'clock in the morning to six at night; whilst the lower face would be shone upon from sunrise to six in the morning, and from six in the afternoon to sunset. The reasoning upon which these principles are founded will bear studying a little. We will now proceed with practical details; and, first, on the upper side.

To construct a north polar dial on the upper section, draw a right horizontal line, and mark it A B, and upon it produce the meridian line C E. At right angles to the upper end, C, draw another line parallel to A B. Next divide the meridional line C E into two equal parts, and mark the centre as D, with the distance D E describe a quadrant; then divide this quadrant into six equal parts. Again, from this same centre D draw oblique lines through the points of the intersections of the quadrant. From the lower points where these lines cut A B draw a series of lines parallel to the meridional line C D E. The points of intersection of these lines and the quadrantal lines will be the hour points; commencing with the meridional line as 12, and marking off to the right 1, 2, 3, 4, 5, the horizontal side of the quadrant being 6 o'clock. Continue, and set off to the left hand from the meridian 11, 10, 9, 8, 7, and, as before, the horizon of the quadrant being 6 o'clock; do the same after producing an upper horizontal line, F G, across the upper end of the meridian at C. Last of all fix a perpendicular style equal to the radius of the quadrant D E, or on two points at C and E fit an iron rod. Then will your dial be complete. An upper polar dial differs only from an east and west dial joined together in the line of six o'clock, in situation and the arrangement of the hours.

We will next explain what a lower polar dial is. In marking it off you miss the hours of the forenoon 9, 10, 11, and 12; and 1, 2, and 3 of the afternoon.

We will now present our readers with what we look upon as one of the most interesting problems in the construction of dials; this is neither more nor less than a kind of many-faced production, which is called the block dial. The way to construct it is this.

Make for yourself an octagonal block, taking care that its eight sides have sufficient breadth, each and each, to contain the hour lines of a dial: its front and back sides will be sure to have such space. Mount it on a glass-shaped foot any height you please, put it before you on the table, and take a good look at it. You can then dismount it, and carry out the following instructions with respect to it, and you will draw all the primary dials upon it. Perhaps we may, as a reminder to the very young student, state that an octagonal block is a figure having front and back faces, with eight sides round what we look upon as its edge. It must not be confounded with octahedron, which is a solid figure having eight equilateral triangles resting upon equal bases; it is a Greek compound word—*okto*, eight, and *hedra*, a base—turned into English. The problem given is to draw all the primary dials upon such a block. Well, let us begin with the uppermost octagon. All that you need do is as follows:—

Draw a line from back to front of the octagon, equally cutting it into two, which will be the meridional line, and mark A B. From any point below A, and at a right angle to it, make another line equal to the elevation of the pole; mark the extremity of this as D. With the same distance as C D, mark off along the meridian and call it E. Now join D and E and we have the dimensions of the style, in the form of the triangle C D E. Let us convert this triangular figure into a mechanical one for the purpose of showing exactly what it means. Suppose that, instead of its being lines drawn with a pencil, it was a thing of brass, this would be the result. Upon raising it on the meridional edge, and keeping it there, you would find the style of your dial at once; therefore, it serves as the geometrical

model from whose angles and measurements you can construct the metal one. The next work that we do is to lay one point of the compass on C, and the other point on D. Describe a quadrant round to the line of the meridian again.

We strongly suspect that the reader begins to have a faint glimmering of what we are driving at.

Having made our quadrant, we next divide it into six equal parts, with the compass at the point E, where we started from to make the quadrant; lay off a horizontal diameter at right angles—mind that—to the meridional line A B. From B through the six divisional points of the quadrant produce the same number of lines, cutting the last made diameter. Then, from the upper end of the meridional line at A draw more straight lines, each of which will cut through at the points of junction of the quadrantal and the horizontal lines; continue these lines to the edges of your octagon. Number the meridional line at the lower extremity 12, and run on to 11, 10, 9, 8, 7, &c., to the right hand. On the left-hand side write 1, 2, 3, 4, 5, &c., from the same distances as the figures on the right-hand side. Those figures are the hours of the morning, whilst those on the left-hand side are the hours of the afternoon, as the shadow of the style will testify when the sun shines upon it.

Well, before we bid our friendly reader "Good-bye" for the month, is he fully aware of what he has done? He has turned his octagonal side into a simple horizontal dial!

(To be continued.)

ANNUAL MEETING OF THE ROYAL ASTRONOMICAL SOCIETY.

THE annual general meeting of this Society was held at the Society's Rooms, Burlington House, on the 11th ult., Professor Adams, president, in the chair.

Part of the annual report was read by the secretaries. It appeared that the Society is in a very prosperous condition—the number of Fellows has increased by thirteen in the course of the year. The Society have been living within its income, and a sum of 2,000*l.* has been left to it by Mr. Carrington, one of its deceased fellows.

In the president's address he alluded to the presentation of the gold medal of the Society to M. Leverrier. It had been hoped that the distinguished French astronomer would have been present at the meeting; but, owing to an unfortunate mistake as to the day, M. Leverrier wrote at the last moment to say that he was unable to attend. The president then gave an historical account of the investigations of M. Leverrier and of the important physical results to which he had been led, amongst which was the prediction of a necessary alteration in our estimate of the sun's distance.

The gold medal was then handed to Dr. Huggins, as foreign secretary, with the request that he would, in transmitting it to M. Leverrier, express the interest with which the Astronomical Society had followed his unwearied researches, and the admiration with which its members regarded the skill and perseverance by which he had succeeded in binding together the planets of our system, from Mercury to Neptune, with the chain of his analysis.

The following officers and council were then elected for the ensuing year:—President: Dr. Huggins. Vice-presidents: Prof. J. C. Adams, Sir G. B. Airy, Mr. De la Rue, and Mr. Lassell. Treasurer: Mr. Whitbread. Secretaries: Mr. Dunkin and Mr. Ranyard. Foreign Secretary: Lord Lindsay. Council: Captain Abney, Mr. Bret, Prof. Cayley, Mr. Christie, Mr. Glaisher, Mr. Knobel, Mr. Knot, Captain Noble, the Rev. S. J. Perry, Prof. Pritchard, the Earl of Rosse, and Captain Tupman.

ROYAL MICROSCOPICAL SOCIETY.

THE anniversary meeting of this Society took place on the 2nd ult., H. C. Sorby, Esq., in the chair. The various reports and annual statements were read, and the following officers elected for the ensuing year:—President: Henry Clifton Sorby, F.R.S.—Vice-presidents: Charles Brooke, M.A., F.R.S.; Rev. W. H. Dallinger; William B. Carpenter, M.D., F.R.S.; Hugh Powell, Esq.—Treasurer: John Ware Stevenson, F.R.A.S.—Secretaries: Henry J. Slack, F.G.S.; Charles Stewart, M.R.C.S., F.L.S.—Council: Robert Braithwaite, M.D., F.L.S.; Frank Crisp, LL.B., B.A.; John E. Ingpen, Esq.; Emanuel Wilkins Jones, F.R.A.S.; William T. Loy, Esq., Henry Lawson, M.D.; John Millar, L.R.C.P.E., F.L.S.; John Rigden Mummery, F.L.S.; John Matthews, M.D.; Frederic H. Ward, M.R.C.S.; Francis H. Wenham, C.E.; Charles F. White, Esq.—Assistant Secretary: Walter W. Reeves.

THE QUEEN'S NECKLACE.

EIGHT months elapsed before De Rohan was brought to trial. The parliament devoted eight entire days to the hearing of the report; and on the 30th of May the proceedings commenced. At five in the morning all the members of the family of Rohan, and of the house of Lorraine, men and women, clad in deep mourning, ranged themselves along the passage which the members had to traverse. At eight o'clock, the court having assembled, the counsellors of the King placed their resolutions on the bureau. They were about to be read, when Robert de Saint Vincent rose "to denounce," he said, "an unheard-of violation of the laws, committed under the eyes of the court, and in the very sanctuary of justice; an accused, who ought to be protected by the laws which he comes to invoke, is here, however, surrounded, and, moreover, by a military guard—that accused is Mons. le Cardinal de Rohan." And as if the acquittal of the Cardinal was certain, "What will become of him, hedged in as he is by a military force, when you have struck from him his chains? He will not be able to withdraw himself from it; and for the first time the decision of the court will be without effect, and its decrees remain unexecuted. I demand, therefore, that, before proceeding further, the chamber deliberate upon what alarms me in respect to itself; and that it pronounce upon the means employed against Mons. le Cardinal."

The president replied to the murmurs of a part of the assembly, that he had his orders on this subject, and that they must listen to the decisions of the procureur-general. These were, with respect to the Cardinal, that "he should be forbidden to approach any place where there was a royal mansion, and all other places which the King and Queen might make their residence, until it should please the King to decree otherwise; that for a time, to be fixed by the court, he should be deprived of the state and dignity of grand almoner of France, with which it had pleased the King to honour him; that he should be condemned to such sum as the court should think fit; and that he should be kept in prison until he had obeyed and satisfied these decrees." The accused were then examined. Placed first in the dock, Rétaux de Villette admitted, weeping, that he had forged the signature of *Marie Antoinette de France*; and, without attempting a useless defence, confined himself to invoking the pity of his judges. After him appeared Madame de Lamotte. At this solemn moment she had lost nothing of her habitual effrontery. Before entering the hall she had said to one of the officers that "she was going to confront a knave;" she advanced with head erect and a smile on her lips, and covered with a profusion of jewelry. However, when the official placed her in the middle of the court, and pointed to the dock, she lost heart for a moment; but she immediately recovered herself, sat down, and in less than a couple of minutes arranged herself so comfortably, that she seemed to be in her own room, and reclining in the softest of easy-chairs. Being asked by the clerk whether she did not know the Abbé Sabatier to be favourable to her, she exclaimed, "Here is an insidious question; I expected you would put it; and here is my answer." She replied to other interrogatories with the same assurance, and spoke for a long time with great fluency and an ease and firmness which, though it could not move or excite the court, astonished it. She persisted in maintaining her innocence, and denounced the Cardinal as the author of her misery. She asserted that there was no false conspiracy, no intrigue; but that all that she had stated of the transactions between the jewellers and the Cardinal was true; and that it was only in order to shield himself that the Cardinal denied everything. When she left the court, the president sent to the Cardinal to say "that the seat was vacant, and that he might present himself before the court." The Cardinal appeared in a violet robe, and decorated with his orders. His emotion was visible; he was extremely pale, and his knees trembled beneath him. Five or six voices exclaimed that the Cardinal appeared ill, and the president invited him to sit down. Skilfully questioned by some members devoted to his cause, he took courage, and spoke for half an hour with considerable force, protesting against the trial, and declaring, moreover, "that he had been completely blinded by an intense desire to regain the good graces of the Queen." Having finished his speech, he bowed to the members, who all bowed to him in return. Mdle. d'Oliva next followed, but so affected with grief, that she could not answer a word; this touching scene so moved every one that only questions of form were put to her. There now remained to examine only Cagliostro, who acted before the judges as he had before the public. He wore a green dress embroidered with gold, and his hair, braided from the top of his head, fell in little plaits over his shoulders. "Who are you? whence do you come?" was asked of him. "Noble traveller," he replied. At these words every one began to titter; and Cagliostro, seeing their good-humour, went on with his defence, speaking Italian, Latin, Greek, and Arabic; he poured out this jargon

with the accent of a Neapolitan prophet, and left the court delighted to have made his judges laugh. After a long and stormy discussion the court made its decision. By a majority of three votes the Cardinal, as well as Cagliostro, were acquitted of the charges brought against them. Mdle. d'Oliva was outlawed; Villette banished for ever from the kingdom; Mons. de Lamotte was condemned to the galleys for life; and Mdle. de Lamotte to be whipped, and branded with a hot iron with the letter V on the two shoulders; this done, she was to be conducted to the prison of La Salpêtrière, to be confined there for life.

When it was known that Mons. de Rohan had been acquitted, the people became delirious with excitement and enthusiasm. The members as they left the chamber were received with acclamations and clapping of hands. At the palace, at the Bastille, at the Hôtel de Strasbourg, nothing was heard but cries of "Vive le parlement! Vive Mons. le Cardinal!" No sooner had the prince returned to his hotel, than the Dames de la Halle went to compliment him, and presented him with a bouquet; the crowd several times obliged him to show himself on the balcony with Cagliostro; and Paris went so far even as to talk of a general illumination. On the other hand, the court was struck with consternation at the result of the trial; the Queen especially feeling herself grievously insulted and cruelly wronged by the verdict. In this unbridled joy of the people, in this triumph decreed to an ecclesiastical debauchee, to the ridiculous hero of the scene in the Bosquet de Vénus, to the bosom friend of a vulgar and infidel charlatan, what bitter derision of, and what depth of hate against, the court, against the Queen, and against the ministers! Well has it been said that the trial of the necklace was the prologue to the Revolution.

(Concluded.)

PROGRESS OF ASTRONOMY DURING THE PAST YEAR.

UNDER the above heading we find the following in the yearly report of the Royal Astronomical Society. Seventeen minor planets were discovered since its last annual anniversary. In the month of November alone six were discovered in Europe. The number of known members of this remarkable group of minute planetary objects now amounts to 159. The astronomers who have been the most active in this department of astronomy are MM. Palisa, of Pola; Peters, of Clinton, U.S.; Borrelly, of Marseilles; and Prosper Henry, of Paris. M. Leveau, of the Paris Observatory, has made a new and elaborate investigation of the perturbations of D'Arrest's periodical comet. Mr. Langley has given in the *Comptes Rendus* the results of his investigation of the relative temperatures of different parts of the sun's surface. He has employed a refracting telescope of 13 in. aperture, and has enlarged the focal image of the sun to a circle of 2 ft. He has made use of a delicate thermopile composed of 16 pairs of very small elements, and has, in the course of his experiments, tested Padre Secchi's statements as to the comparative heat derived from the sun's limb, and from the apparent centre of the disc, and as to the equatorial regions being hotter than the polar. Professor Mayer has invented a method for registering isothermals on the sun's disc, depending on the fact that the double iodide of copper and mercury becomes darker at a temperature of 70 degrees C. The blackened surface of a sheet of thin paper coated with the iodide on the back is exposed to the image of the sun formed in the telescope, and the different isothermals are obtained by using different areas of the object-glass.

THE WESTMINSTER CLOCK.

IN reply to an inquiry in the *Mechanic*, as to the probable causes of the small errors of the Westminster clock, Sir Edm. Beckett writes:—"I cannot give any satisfactory answer to 'Aliquando's' question, as to the probable causes of the small errors of the Westminster clock, inasmuch as the temperature error and the barometrical one are compensated or self-corrected, and the variations in friction of the escapement are insensible. I can only suggest that a pendulum suspended in a tower, narrow for its height, at 180 ft. above the ground, close to a road with heavy traffic, is probably subject to tremors by no means insensible at that height; and that as thunderstorms sometimes affect it seriously, the smaller variations of atmospheric electricity may affect it slightly. A few weeks ago there was a paragraph in some newspapers, saying that after ten starless nights the standard Greenwich clock was found 1½ sec. wrong. I have no better authority for it, and I did not think it worth while to inquire, as the statement was quite consistent with every clock-rate I have ever seen, even though the error may have been no greater in ten weeks than in ten days."

A TREATISE ON PITCHINGS.

(Continued from page 151.)

XXVI. Let us now examine what ought to take place when the wheel drives before the line of centres; this will be the exact opposite of what has been already said, that is to say, the pinion will be increased, and the wheel diminished by the quantity of the pitching. In order to understand the figure which the leaf ought to have, we must consider that if the leaf which is driven by the tooth before the line of centres should turn backwards in order in its turn to drive the tooth, the same curves of the leaf and of the tooth will continue to give a perfect pitching, but then the leaf will in reality drive the tooth after the line of centres; thus the tooth which drives the leaf before the line of centres, or the leaf which drives the tooth after the line of centres, give precisely the same curves.

We ought, then, to transfer to the leaf that which we have up to the present said of the tooth which drove the leaf after the line of centres, that is to say, the same curve ought to roll externally on the pinion in order to describe the leaf, and within the wheel to describe the tooth; there only remains to apply to the pinion which drives that which we said of the wheel when it drove, in all the preceding articles.

Thus, in the case where we should desire that the tooth which is driven after the line of centres, or which drives before that line, be a right line tending towards the centre of the wheel, it is necessary that the leaf of the pinion be an epicycloid described by the revolution of a circle of which the diameter is the half of that of the wheel, and which rolls on the circumference of the pinion; this is a consequence of article XXII.

XXVII. We can actually find what will be the forms of the leaf and tooth when the tooth ought to drive the leaf both before and after the line of centres. To do this we unite the two preceding cases, and we give to the leaf and tooth the two different curves which are suitable—the one which is only to serve before the line of centres, the other which is designed to drive or to be driven only after the line of centres.

The circumference $L F$ (Fig. 9) is that of the primitive wheel: the circumference $O o$ is that of the primitive pinion; the leaf of the pinion, $s o m$ or $S O M$; the tooth of the wheel $p l k$ or $P L K$; each

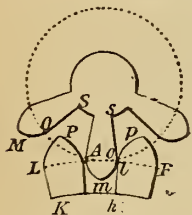


FIG. 9.

is composed of two parts, the portion $l k$ of the tooth re-entering into the wheel which drives before the line of centres; the portion projecting, $o m$ of the leaf, out of the pinion which is driven before the line of centres; the projecting portions $L P$ of the wheel which drives after the line of centres; the re-entering portion $O S$ of the pinion which is driven after the line of centres. It is therefore before the line of centres that the pinion furnishes the projecting part of the pitching, and it is after the line of centres that the wheel provides it. In the actual line of centres we may say that it is neither the one nor the other, since the leaf and tooth touch each other at A . The portion $l k$ of the tooth, and the portion $o m$ of the leaf will be described by any circle whatever, rolling within the interior $L F$ of the wheel in order to describe $l k$, and upon the exterior $o O$ of the pinion in order to describe $o m$ (XXV.); the portions $L P$ of the tooth and $O S$ of the leaf will be generated by any circle whatever rolling on the exterior of the wheel $L F$ to describe $L P$, and in the interior of the pinion $O o$ to describe $O S$ (XXIII, XXIV.)

If the first circle be found to have for diameter the radius of the wheel, and the second the radius of the pinion, the parts of the teeth $L K$, $l k$, and the portions of the leaves $O S$, $o s$, will be right lines tending towards the centre, Art. XI. We have not marked with any letter the parts of the teeth and the leaves which are designed only for symmetry, and take no part in the driving of the pinion; nevertheless it is necessary to give them the form which will ensure the greatest steadiness and render easy their disengagement; besides, as there are occasions where the wheel-work is under the necessity of going backwards, we are obliged to shape them almost round.

XXVIII. If it be asked what ought to be the shape of the leaf and the tooth when the pinion which is driven by the tooth should turn backwards to drive it in its turn, it is easy to see that as the lines of direction and the reciprocal forces are the same, the curves will also be alike. We must only observe this, that the portion of the leaf which was driven *after* the line of centres will thenceforth

drive *before* that line, and that the portion of the leaf which was driven *before* will find itself driving *after* the line of centres.

Therefore it will only be necessary to describe the curves in accordance with the preceding articles, and the same pinion which ought to be driven by the wheel will serve to drive it; but if it be desired that the pinion should only drive after the line of centres, we take the pinion such as it was when the wheel drove it before the line of centres.

XXIX. Here then is a general proposition deduced from all we have hitherto said:—1st. The portion which drives after the line of centres ought to exceed the primitive circumference; that which drives before the line of centres ought to fall within, whether it be a leaf or a tooth. 2nd. The portion which drives after the line of centres, be it a leaf or a tooth, is always described by a circle rolling externally on the primitive circumference which drives; and that which is driven is generated by the same circle rolling internally on the circumference which is led.

The portion which drives *before* the line of centres is generated, like that which was driven *after*, by a circle rolling within the primitive circumference which drives, and the portion which is driven *before* is generated by the same circle rolling on the outside of the circumference which is driven.

XXX. That which we have up to the present called primitive wheel and primitive pinion ought to be understood of two circles which bear the exact proportion to each other as the number of teeth in the one is to the number of leaves in the other. I suppose that C and P (Fig. 4) are the centres of a wheel of thirty teeth, and a pinion of ten leaves; it is clear that the pinion must make three turns for each one of the wheel: it ought, therefore, to have a circumference and a diameter the third of the circumference and diameter of the wheel. Thus we divide the distance, $C P$, into four parts; one of these parts, $P M$, will be the radius of the pinion, and the remainder, $C M$, the radius of the wheel: there we shall have the primitive leaf and the primitive wheel.

XXXI. Although the preceding articles have treated of the driving, which commences before the line of centres, it is not the less true that we ought to avoid it as much as possible, because there takes place a rubbing in the contrary direction, and a kind of butting when the leaf and the tooth enter in with each other; a friction which is always more severe than that which takes place in the disengaging and escape of a tooth; besides, all the dirt which is pushed back and driven out of the pinion by this last movement, is on the contrary brought back and held fast by the movement which takes place before the line of centres.

XXXII. But it is not always possible to begin the driving of each leaf precisely in the line of centres; if the pinion be low-numbered, as is a pinion of eight leaves or less, the wheel will necessarily lay hold before the line of centres, above all if the leaves of a pinion are of the proper size.

Fig. 10 represents three leaves of a pinion of eight, of which the right faces driven by the wheel are, $D A$, $D B$, and $D C$. I suppose that the diameter of the wheel is five times greater than that of the pinion; it ought to have five times more teeth, that is to say, 40; thus each tooth with the space which corresponds to it will occupy nine degrees, because the fortieth part of 360 is nine. We take then the arc $B E$ of nine degrees, and with a circle, of which the diameter is equal to $B D$, we describe a portion of an epicycloid $E G$, which will touch at G the leaf $D A$, give to it a like part $G H$; but then there will remain only $B H$ for the space of the teeth and the

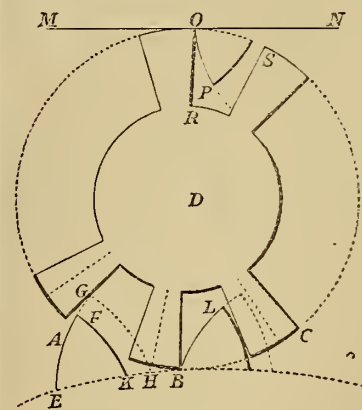


FIG. 10.

thickness of the leaf, which would be too small, for it is necessary in practice to make the space at the least equal to the complete tooth*, and the thickness of the leaf equal to that of the tooth, or even a little larger, above all if it is the pinion which drives. It will be necessary to break off the tooth then at F , give to it the like portion $F K$, in such a way that $E K$ be equal to $K B$,

* *An plien*, to the full, evidently means the full width, or complete tooth.

that is to say, the space equal to the full breadth, and make the thickness of the leaf equal to B K. But then the extremity, F I, of the tooth will no longer touch the leaf D A, when the succeeding tooth B L will have laid hold of the leaf D B before the line of centres.

Thus it is only in pinions above eight, or even nine, that it is possible to begin the driving on the line of centres by keeping to the rule of curvatures, which has just been settled, and that for the solidity necessary; it is then important to make use of pinions which have at least ten leaves, which is always possible, more especially in clocks where the precision which we seek is chiefly necessary. By this construction we shall have in addition the advantage of making the curvature of the teeth less, and more uniform, consequently much more easy to be brought into shape.

XXXIII. The principles which we have just established give also the least possible amount of friction, and was exacted by Art. I., because the effort cannot be less than it actually is, and in following these principles produce the same effect, that the rubbing surfaces cannot possibly come in contact in smaller spaces, and experience less resistance.

(To be continued.)

WATCH FOUND IN A SHARK.

ON December 1, 1787, some fishermen fishing in the river Thames, near Poplar, with much difficulty drew into their boat a shark, yet alive, but apparently very sickly. It was taken on shore, and, being opened, in its belly were found a silver watch, a metal chain, and a cornelian seal, together with several pieces of gold lace, supposed to have belonged to some young gentleman who was unfortunate enough to have fallen overboard, and to have been caught and swallowed by the shark. The body and other parts had either been digested or voided, but the watch and gold lace, not being able to pass through it, the fish had become sickly and would very soon have died.

The watch had the name of "Henry Watson, London, No. 1369," and the works were very much impaired. On these circumstances being made public, Mr. Henry Watson, watchmaker, in Shoreditch, recollected that, about two years previously, he sold the watch to Mr. Ephraim Thompson, of Whitechapel, as a present to his son on his going out on his first voyage, on board the ship *Polly*, Captain Vane. When about three leagues off Falmouth, by a sudden heel of the vessel during a squall, young Thompson fell overboard, and was no more seen. The news of his being drowned soon after came to the knowledge of his friends, who little thought of hearing anything more concerning him.

PRESENTATION TO MR. JOHN WYCHERLY, OF PRESCOT.

A VERY pleasing incident in connection with the watch trade, and evincing the kind feeling between employer and workpeople, recently took place, by the presentation of a testimonial to Mr. John Wycherly, of Prescott, by the people in his employ. The testimonial consisted of a very handsome silver *épergne*, and was accompanied with the following address:—"There has been a very generally expressed wish amongst the men in your employ to present to you some token of their appreciation of your well-proved kindness as an employer, and as an acknowledgment of the benefits they receive from the present state of perfection to which the trade has arrived; which by all practical men is admitted to be due to your knowledge of Watch Movement manufacturing in all its branches, combined with the more perfect appliances which your own ingenuity and skill have introduced into its manufacture, thereby dispensing with much physical exertion, and by an increased supply of sound movements, ridding the market to a very great extent of foreign and inferior watches. There is also another marked feature in your history as an employer; that is, the shortening of the hours of labour. The present working hours which you have adopted compare very favourably with those of ten years ago; this boon being of itself sufficient to have gained our gratitude, as well as that of future generations who may be engaged in this trade. Such being a few of the considerations which have induced us to present to you this simple token of our esteem, begging your acceptance of the accompanying *épergne*, we respectfully subscribe ourselves, on behalf of the whole of your employés."

BRITISH HOROLOGICAL INSTITUTE.

THE half-yearly general meeting of the above Institution (and of which space would not allow us to give a detailed report in our last number) was held on January 18th, Mr. Glasgow, vice-president, in the chair. From the half-yearly report we glean the following:—"Although some of the items of income show a slight falling off, as compared with the corresponding half of last year, the council have every confidence in the continued advancement of the Institute; the deficiency referred to, being caused solely by lax collection of accounts, will result in an increased income during the half-year ensuing. The term of four years, which the Goldsmiths' Company had specified as the duration of their yearly gift of 50*l.*, having expired, the council applied to the company for a renewal of the grant, and the Goldsmiths' Company have considerably resolved to continue the grant for a further period of four years. Mr. Jackson, vice-president, has placed a prize of 5*l.* 5*s.* at the disposal of the council for the best tool for measuring lever escapement angles. The conditions of competition were published in the *Journal* for October. The council have submitted to the Goldsmiths' Company the propriety of holding an exhibition of watchwork, under their auspices." The chairman and Mr. Bickley alluded to the necessity of primary education, remarking "that the results of efficient primary education would be to raise the status of their trade. The apprentices, at present, were in many instances taken from the errand-boys, and were quite unable to appreciate anything beyond the actual work they were engaged on. Mr. Jackson desired to impress upon the rising generation the necessity of obtaining technical instruction. There appeared to him to be no reason why every young man in the trade should not learn mechanical drawing, as he would learn to write. He knew that to attain eminence in their art required years of assiduous devotion, and almost servile toil. As a Greek philosopher had truly observed, "The gods sell all their kindnesses for pains and labour." The chairman had adverted to the prize offered for a tool for measuring escapements. He believed such a tool would be a great acquisition. The meeting concluded with the usual vote of thanks to the chairman and officers.

GREAT ROBBERIES OF JEWELLERY.

TEMPTATION TO HOTEL PORTERS.

ON the evening of the 28th ult. a daring robbery was committed at Tower House, Shooter's-hill, the seat of Lord Teynham. The family dine at eight o'clock, and consequently most of the servants were engaged in the lower part of the house at that hour. About that time an entrance was effected through a second-floor window into one of the bedrooms, and nearly 1000*l.* worth of jewellery and plate was carried away. The burglars appear to have been acquainted with the geography of the premises and the habits of the household, and probably concealed themselves in the grounds until the dinner-hour afforded them an opportunity for effecting the robbery.

On the same afternoon a quantity of plate was stolen from the house of a gentleman at Wickham, about a mile distant from Lord Teynham's residence.

The residence of the Earl of Egmont, at Banstead, was entered by thieves between eight and nine o'clock on the same evening, and 4000*l.* worth of jewellery stolen from the countess's bed-room.

Eight hundred pounds' worth of jewellery, the property of an English firm, has been stolen from a leading hotel in Dublin, to whose porter it was entrusted for delivery at a Dublin jeweller's by the representative of the firm, who was stopping at the hotel. The porter is missing.

THE chimes of Antwerp Cathedral consist of nearly 100 bells; and a singular feeling results from them when they play under the feet of a person on the summit of the tower (on which is the gigantic clock-face). They throb through the very stones and frame of the building, and every nerve of the body, a result due probably more to the unscientific construction of the frame in which they are contained than to the weight of the hammers.—*Horological Journal*.

ASSAYING.—Our next number will contain an exhaustive article on Assaying. In addition to such historical matter as the subject affords, the current method will be explained from personal observation of the process, as derived from a visit of inspection to one of the leading houses in London. Subscribers desiring extra copies should send early orders to the publisher, as, on account of nothing having before been written about the modern system of assaying, except in expensive books, there will doubtless be a great demand for our April issue.

THE NEW PATENT BELL-CHIMING MACHINERY.

OF all the inventions that have been devised by the teeming brainwork of industrious humanity in furtherance of the "harmony of sweet sounds," none have taken more deep or more enduring hold of the affections of mankind than bells. Emperors and hierarchs—rulers of men and rulers of minds—those whose lives are the beacon-lights of the Christian world, have all looked upon campanology as something whose advancement was of paramount importance. "Men of royal siege," poets, philosophers, and the unbending devotees of practical science; the lord in his ancestral hall and the peasant in his humble cottage home have smiled the smile of real enjoyment when the ever-welcome peal "attuned" upon the ear. How often have the poet, the moralist, and the historian, and even the preacher, under various rhetorical forms—argument, metaphor, simile—struck home upon the mighty bell to charm, to persuade, and to convince!

It is not our intention in the present paper to enter into a learned and technical discussion of the subject; nevertheless, any account of either chimes or chiming machinery could hardly be deemed sufficiently comprehensive without saying something about what that machinery acts upon. Passing by whatever may have been existent in the ancient world—which is very interesting, but for which we have no space at present—we come upon times pertaining to the history of our own country.

The first peal of bells known in England were set up, towards the close of the ninth century, at Croyland Abbey, Lincolnshire. The first was a large bell, followed in due time by a "ring" of six others. The invention was said to come from the Campania, in Italy, from which "campanile," a bell-tower, and "campanology," the art of bell-ringing, are derived. As may be supposed, with the extension of bells, bell-founding soon became an art of itself, and was cultivated in the monasteries of the period. Then the bells had various functions assigned to them, both religious and profane; and there arose bell-founders who made reputations in both ways, which we shall mention hereafter. Bells, too, were "blessed," according to the devotional tendency of the time, and inscriptions round the upper part of the bell were epigrammatic curiosities in their way. In Spelman's "Glossary" we find a Latin couplet, thus:—

*"Laudo Deum verum, Plebum voco, congreco Clerum,
Defunetos ploro, Pestem fugo, Festa decoro."*

"I praise the true God, I call the people, I assemble the clergy,
I mourn the dead, I put to flight the plague, I celebrate festivals."

This and some others following were said to be either cut in or cast upon them. Here is one not unlike the last, but in a cantering, jingling style that will suggest to some readers a verse or so that they may have met with in their Virgilian days, namely—

"Quadrupedante putrem sonitu quatit ungulo campum,"

"The hoof shakes with prancing din the crumbling plain,"

alluding to the cantering of a horse, which the reading of the verse suggests. Now read what the bell says—

*"Funera plango, fulgura frango, sabbate pango,
Exeunt lentos, dissipo ventos, paco eruentos."*

"I bewail deaths, I dispense lightnings, I promise the sabbath,
I quicken the slow, I dispel the winds, I appease the bloodthirsty."

That is not bad for a bell. Those bell-sayings have been repeated in various forms on English or other bells. Here are a few: "God save the Queen, 1599." This means Queen Elizabeth, and two years after the execution of Mary Queen of Scots. There are several "God save the King," and "God save King Charles, 1625," with many quaint ones.

The poets have made effective use of bells. *Othello* calls out, in the midst of poor *Cassio's* drunken scene, "Silence that dreadful bell, it frights the isle from her propriety!" And *Machbeth* too: "The bell invites me. Hear it not, Duncan, for it is a knell that summons thee * * * *!"

The monasteries in Scotland and the borders of both countries were rich in bells; as witness the pathetic description of the "soul-bell" in "Marmion" (Canto III.)—

"And bade the passing bell to toll
For welfare of a parting soul."

Slow o'er the midnight wave it swung,
Northumbrian rocks in answer rung;
To Warkworth cell the echoes rolled,
His beads the wakeful hermit told;
The Bamborough peasant raised his head,
But slept ere half a prayer he said;
So far was heard the mighty knell,
The stag sprung up on Cheviot Fell,
Spread his broad nostril to the wind,
Listed before, aside, behind;
Then couched him down beside the hind,
And quaked among the mountain fern
To hear that sound so dull and stern."

Of celebrated bell-founders we have read of the Rudhalls, of Gloucester, who are said to have flourished from the time of Henry VIII. to the early part of the present century. The Westminster Abbey bells were out of their foundry. The Purdues, of Salisbury, too, had a long celebrity; and Gray, of the eastern counties, and Watts, Eayres, and Arnold, of Leicester, as well as Mears, of London, were among our good old bell-founders.

Bell-ringing, Sir John Hawkins tells us, in the "History of Music," is a practice said to be peculiar to England. From the fame which has been acquired here in that respect this kingdom is called abroad the Ringing Island. So much for bells, as bells; and the reason why we have written this brief introduction is to excite an interest and lead up to what is to follow. When bell-ringing began to develop itself as a musical entertainment of its kind, and church clocks were being moved on the road to perfection, it would speedily be born of the inventive minds of the age that to make the clock do the bell-ringing would be a great stride in advance, and this brings us to—

BELL-CHIMING.—This art is stated to have been invented about the latter part of the fifteenth century, and, like the bells themselves, it came to us from the continent. Probably most of our readers have seen the chiming machinery as it is found on the old plan in our churches. To those who have not we may say that it is constructed much in the following manner:—There is a plank-made cylinder called the barrel, usually about 2 to 3 feet in diameter, and 4 to 6 feet long. All over this barrel, at regulated intervals, to answer to the notes of the tunes, are strong iron pins. This barrel is attached to the going part of the clock by wheelwork, containing a provision for the going part to let off at the fixed time. The function of the pins is, as the barrel revolves to lift the levers attached to the hammer-cords, and so make the hammers strike on the bells overhead. Where the barrel is "pricked" for more than one tune a sideways contrivance is fixed to it, so that the pins that played "God save the Queen" this time would miss the levers, whilst those intended for "Rule Britannia" would be in the lifting or pulling position. We ask our readers to pay special attention to this, as we shall have further occasion to notice it for the purpose of drawing a comparison. We may just add, by way of an aid to memory, that a barrel pin, not more than a fraction of an inch in diameter, will soon wear away by the friction of lever-lifting. And this is found actually to be the case; however, we will not pursue this part of the matter until we have the opportunity of placing the two systems, the old and the new, side by side, before the reader. Our object now, principally, is to make the whole subject interesting, and then to proceed to a critical examination.

It will be readily understood that when the church clock began to play music on the bells the hearers were not slow in appreciating the boon. The system spread rapidly all over Europe, and, in fact, became a new "institution of the country." The poets and the dramatists took it in hand, and, to quote a common expression, "its fortune was made." Then it was that bell-chiming built for itself a home in the hearts of the people which it has retained to this hour, and which not only does not weaken, but grows stronger and stronger every year, as indisputable evidence amply testifies. Of the poetical allusions to bell-music we cannot forbear giving a few examples; they will add zest and cheerfulness to our paper.

In the first place, we find that Shakspeare makes *Henry IV.* say, in that terrible lecture scene, to the *Prince of Wales*—

"What! canst thou not forbear me half an hour?
Then get thee gone; and dig my grave thyself;
And bid the merry bells ring to thine ear
That thou art crowned, not that I am dead."

When *Justice Shallow*, in "*Henry IV.*," is "pulling the long bow" to his cousin *Silence*, before *Sir John Falstaff*, he says—

"Ah, cousin Silence, that thou hadst seen that that this knight and I have seen! Ha, Sir John, said I well?"

"We have heard the *chimes* at midnight, master Shallow."

"That we have, that we have; in faith, Sir John, we have; our watch-word was, 'Hem, boy!'—Come, let's to dinner:—O, the days that we have seen!—come, come."

Dryden says—

"Love Virtue, she alone is free;
She can teach you how to climb
Higher than the spheric *chime*."

"And ere we came to Leonard's rock,
He sang those witty rhymes
About the crazy old church clock
And the bewildered *chimes*."—WORDSWORTH.

"With lifted arms they order every blow.
And *chime* their sounding hammers in a row."—DRYDEN.

We will go no further in quoting verses relating to bells and chiming, but the poets are full of their praises, and so, taking up the burden of admiration, are the people upon whom the poets have exercised their influence. It need not, then, be wondered at that such music has so long been universally popular, so popular that Ben Jonson thus uses it as a simile:—

"The voice so sweet, the words so faire,
As some soft *chime* had stroaked the air."

LUND & BLOCKLEY'S SYSTEM.

Messrs. LUND & BLOCKLEY, of 42, Pall Mall, clock and watch makers to the Queen, and to the Imperial Family of Russia, have, in Imhof's patent, perfected by their own ingenuity, had the rare honour of introducing to the chime-loving public of these realms perhaps the greatest improved combination in chiming machinery, both in principle and practice, that has been seen since the invention of the art, four hundred years ago. This is saying a great deal, but, we think that, when our readers have read our description, they will be inclined to think that we have not come to a hasty conclusion; speaking for ourselves as somewhat acquainted with mechanical action, we certainly never saw anything like this new chiming work. But before we proceed further we will state under what circumstances we saw it. In one of the closing months of the year we went to visit the newly-erected church of St. Luke, Parliament-street, Derby, for the special purpose of seeing the chime system under notice in operation upon a large and permanent scale; and here, we trust, that a few words about the church itself will be serviceable for the purpose of the better understanding of the whole subject.

The late Right Rev. Dr. Lonsdale, D.D., whose name was familiar to the church-going Londoners of five-and-thirty years ago, through being Principal of King's College, Archdeacon of Middlesex, and many years preacher at Lincoln's Inn, became Bishop of Lichfield in 1843. He died in 1867, and the feeling of reverence for his memory was so deep-seated that it was determined to found a Memorial Church at Derby in perpetuation of that feeling. The Rev. F. J. Lyall, M.A., took the project in hand with an enthusiastic belief in its accomplishment, and, to the credit of himself and the friends whom he gathered round him—foremost among whom, as is usual in every good work, were the ladies—an enduring monument of the episcopal life of the "good Bishop Lonsdale" rose heavenward to enrich the architecture of Derby. It was consecrated in June, 1871, by the present Bishop of Lichfield, the Right Rev. Dr. Selwyn, the Rev. F. J. Lyall, M.A., being the first incumbent. The sacred edifice was designed by Mr. Frederic J. Robinson, architect, of Derby, and ecclesiastical surveyor of the diocese. The style is that of what is known as the transition period from early English to decorated Gothic, and makes the structure look every inch a church; in truth it has become an attractive feature in the architecture of the ancient town—the "Northworthige" of our Saxon ancestors, the "Deoraby" of the Danes, and the favoured royal borough of Edward the Confessor. The dimensions of the church are as follows:— nave 85 ft. long, 52 ft. 6 in. wide, and 45 ft. to the ridge of the roof, all inside measurements. The chancel is 37 ft. long, 32 ft. wide, and 42 ft. high. There are 750 sittings, all free. The tower is a very imposing part of the entire structure. It is a square one of 28 ft. at the base, and 23 ft. 6 in. at the level of the parapet. The total height from the floor is 142 ft.

We now come to the "bell-chamber," which is to us the central and important goal of all our journey. It is very lofty, and is 15 ft. on every side, or "15 ft. square," on the floor. In order that what we are about to explain may be the more easily understood, we will here state that this chamber is divided into a lower

and an upper floor. In the upper floor are the eight bells of the church, and in the lower are the clock and the chiming machinery. This clock is an admirable specimen of London-made first-class workmanship. It has a three-wheel high numbered train, Graham dead-beat escapement, and $1\frac{1}{4}$ compensation balance pendulum. With only a 15 cwt. going power on a double line, it drives four pairs of hands on four dials of 5 ft. 6 in. diameter each. It is fixed on two brackets that are let into the wall of the tower, stands quite free of the floor, by which means it rests on solid supports, and is thereby unaffected by joist and boarding vibration. It is snugly ensconced in a glass case; and on a plate affixed to it is the following inscription:—

"This clock was set going by the Rev. F. J. Lyall, M.A., July 16, 1875. D. G." Its only other function, beside driving the hands, is to lift and let fall a small weight to start the chiming machinery in the centre of the same clock-room, but which is in no way connected with the clock frame, consequently avoiding all possibility of the vibration of the striking and chiming injuriously affecting the going rate of the clock. This, in itself, is a great gain for time-keeping.

The following description of a machine manufactured under the patent for Christ Church, Weymouth, will give us all the information we require about its main features. The only difference between the two being that they have in this case adapted their plan of making the one weight and the one train of wheels do the work of the ordinary clockmaker's three weights and three trains of wheels. This is a very advanced improvement that deserves to be widely known. We must also emphasize the fact, for the information of the clock trade, that the obvious advantages of this plan make themselves manifest; but their application can only be obtained under the patent by which they are covered. We must, furthermore, note that the actual turret machinery is much larger, and much more powerful than what is indicated by the wood-cut of the model, or than the Weymouth machine. The main principles are the same throughout; the mechanical arrangements for the chiming of the quarters and the striking of the hours being of the simplest possible kind. Here is the Weymouth machine.

"The machinery, which was made by Messrs. Lund & Blockley, 42, Pall Mall, and William and Mary Yard, Little Pulteney-street, London, watch and clock makers to the Queen, is constructed under a patent, which was the invention of Mr Imhof, of 547, Oxford-street. He originally used it for the drum beaters of the self-acting organs, of which he is the sole manufacturer in London; and it occurred to him that the same idea would answer for the hammer to strike on bells in chiming machinery. The fundamental principle of the invention is this—that the discharge of the hammer should be independent of the lift. In old chiming machinery this is not so. It will there be found to be done by pins in a barrel of large and ponderous construction, which, in revolving, lift the levers to which the hammers are attached, and let them drop again as their lines of contact are passed. In the patent the hammers are lifted and held by catches till pins in a barrel of small and very light construction pass and release them, much in the same way that a gun is full-cocked by the thumb, and easily discharged by the first finger. The important points to be considered on making the machinery are—to have a very easy discharge and rapid lift, in order to avoid multiplicity of hammers to each bell. This Messrs. Lund & Blockley have most satisfactorily accomplished. It will be found that an amount of pressure can actually be applied to the levers sufficient to break them before they will pass the catches; but, touch the catch in the proper place, and they will pass with the greatest ease. The lift is also very rapid, as many as 24 blows being discharged per minute, so that two hammers only are required to give the most rapid repetition on each note or bell which music can want. The motive power is a weight attached to a drum and main wheel, intermediate wheel to drive the cam, and a worm wheel and worm with fans to regulate the speed. Upon the main-wheel arbor of the machine one of the three barrels belonging to the machine, and hereafter to be described, is placed in such a way that it can easily be removed. This barrel, when the machinery is started, moves round; and, by means of pins in its surface, discharges the catches, the levers fall, and the required blows are struck upon the bells. By means of a simple spring-action a loose pusher is brought into contact with the cam, and the lever is raised again to the catch, and there held till again to be discharged. The barrels are made of wood; they are 10 inches in diameter and 26 inches long, and in them are placed the discharging pins, as before described, at the proper intervals, to produce given tunes or changes. The pins are made of brass, and for the heaviest hammer would not exceed one-eighth of an inch in diameter; any pressure of hammers on the catch which these could not discharge being

destructive of all proper time-keeping; and it will be readily understood that this is the most important point in the machinery, when it is stated that in two barrels which are used for chiming the changes for the services of the church, the actual interval of time elapsing between each blow delivered, is about a quarter of a second, and the actual space occupied in the circumference of the barrel one-eighth of an inch. The barrel makes a revolution once in a minute, rings ring 28 changes in the same time, and the machine is not an attempt only to produce changes at full speed, but this it positively does; and as there are eight blows in each change, it will be seen that 224 blows are discharged and lifted again in each minute. The barrel being 30 inches in circumference, multiply 30 by eight, which will give 240, against 224 blows struck. The 60 seconds in a minute multiplied by four again gives 240, against 224 struck. These facts taken into consideration, the precision of the change—chiming seems marvellous. The time kept is most perfect, so much so that if part of a tune be heard at a distance, and the wind then fails to carry the sound for a bar or two, if the tune be hummed in proper time, as soon as the sound is heard again the note will be found to be the one required precisely at that time. The tunes are 'God Save the Queen,' 'Auld Lang Syne,' 'Adeste Fideles,' 'Blue Bells of Scotland,' 'Rule Britannia,' 'Old Hundredth Psalm,' 'Home, Sweet Home.' It will be heard that each tune is given with the greatest exactness, and in no degree mutilated, as is often the case in chiming machinery of other kinds, to meet the difficulty of lifting the hammers in rapidly-recurring notes on the same bell. One tune will be played over twice each third hour, when the clock is completed; the same or a different one each third hour at will by simply laying a lever up or down. The whole machine is constructed so that each part is easily accessible without disturbing any other, and the whole is of the best materials and manufacture. There are more points in connection with the machine worthy of notice, amongst others a key-board for playing tunes by hand, but the principal have been referred to."

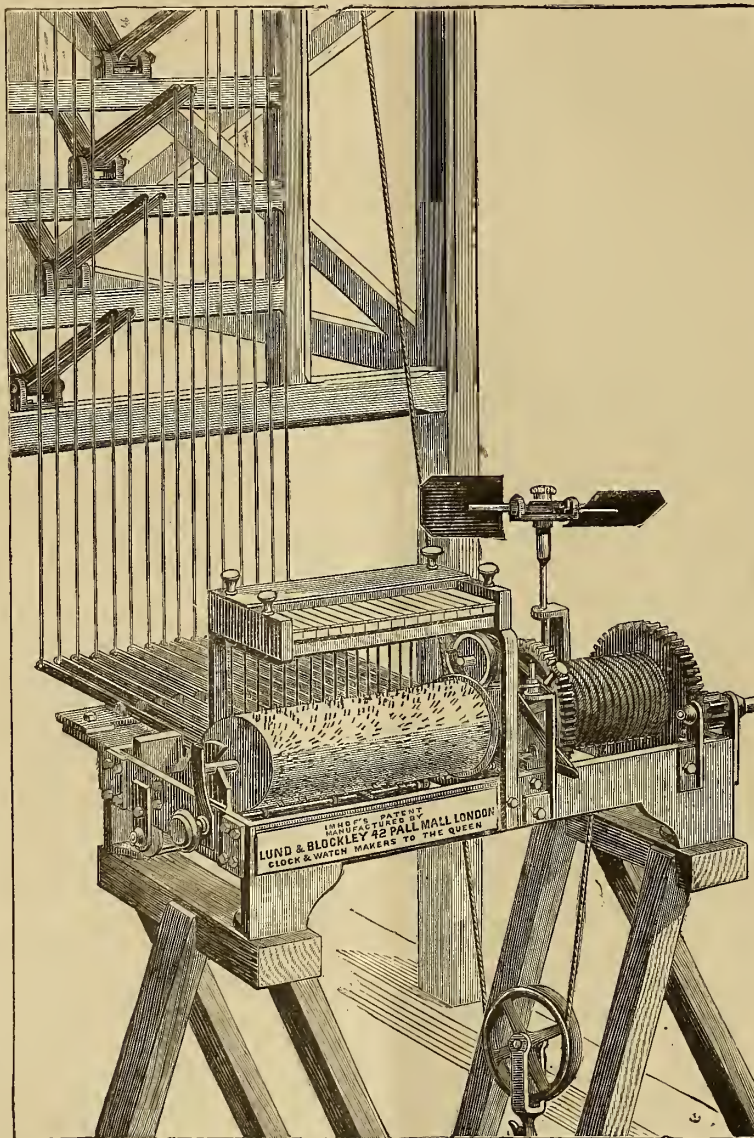
We will now for a moment direct attention to the illustration, and ask the reader to follow us through a brief description of it. On the right-hand side are the rope barrel, the driving-wheels, and the regulating fans, or "fly," overhead. The rope itself is seen passing round a pulley, which is hooked into a ring-bolt in the floor, and then ascends to the ceiling, where it again passes over another pulley, and has the weight at that end. This arrangement is not that adopted in turrets where the weight line passes direct through the floor; but as our illustration is taken from the beautiful large working-model in Messrs. Lund & Blockley's shop, Pall Mall, where want of space will not give the necessary fall, we are bound to explain to the reader what the wood-cut shows. The next thing that we have to direct attention to is the chiming barrel. We have mentioned that in St. Luke's Church tower, Derby, there are eight bells, that these bells have the hours and quarters struck upon them, and also

tunes chimed. Now, the barrel that does all this work is only 1 foot in diameter, and 4 feet 6 inches in length. We alluded to the old form some little time back, remarking that we should refer to it again when the time for comparison came. That time has now arrived, and we will compare.

We have examined the machinery of more than one church, and this is what we found:—An old 4-feet-by-6-feet barrel in an 8-feet frame, with a 30-cwt. weight whirling that barrel round to do only one-third the work of the new machine on its barrel of 1-foot by 4-feet, and a 15-cwt. weight. These amount to very important differences in such an equally important matter. In one thing alone, namely, that there are many, both church and other clock turrets where, whatever might be the desire of the parties concerned, chimes are an impossibility, on account of the space that

one of these old barrels and its framework takes up. The clock *must* be there, and, as there is not room for the pair, the machine cannot enter. We have stated that the pressure, or rather the blows, of the pins of the old machine lift the levers that pull the hammer-ropes. Two serious defects arise here. One is, that the barrel-pins rapidly deteriorate; and another, coming from that very deterioration, is, that the "pull" gets weak and uncertain. These are indisputable mechanical consequences from the nature of the things themselves by the pins wearing out.

Turn we now to the new system, as shown by the illustration of the model. Our readers will see the pins on the barrel, and, beyond the latter, the cams, or levers, with the ropes fastened to the ends of them, and terminating in the V-shaped bell-cranks overhead. The other ends of these cranks that are unseen among the framework are what the hammers are fastened to, so that if the reader could see a little further backward on the upper lift, he would be able to look on the bells themselves. Of course we now refer to the model before him; in a church tower, as will be understood, all that is on the floor above. Well, in this system the pins have nothing whatever to do with lifting the levers. These pins are about the twelfth of an inch in diameter, and stand up in the barrel about a quarter of an inch; they are made of the best brass. In order to explain their



action we shall have to trust exclusively to our pen, and to the kind indulgence of the reader whilst we attempt to describe what cannot be shown.

It will be observed that the levers are all centred on lever-bolts attached to a part of the framework; they are distinguishable in the engraving. As one end of the lever is fastened to the hammer-rope, we have now to add that the inner end, that next to the chiming-barrel, is held in place by what resembles the nose-catch of an ordinary up-and-down door latch. This nose-catch is called the trigger, and its action is always made certain by the forward pressure of an adjusted flat steel spring that is end-pinned on the trigger-plate behind it; it moves freely on a pivot of its own. We wish to impress special attention here, as what we have just described has an important bearing upon the motions that both lead

up to and from it. At a short distance from the end of the lever where we now are, there hangs freely in a slight swing motion what we will call a lifting-bar. This bar has its lower end cut in half-moon form for a purpose that we are about to show. Immediately below it, again, is a steel cylinder of small diameter, fixed parallel to the chiming barrel. To this cylinder are attached, in collets, round steel bars of the same length, placed at given distances from each other; for the sake of clearness, let us say four to the circumference of the cylinder. Of course the usual snail and wheel-and-pinion work connected with a leading-off rod from the clock are there, and will have to be taken for granted.

We think that we are now in a position to wind up and have a tune. The chiming-barrel, the triggers, the cylinder, the lifting-bars, the levers, ropes, and hammer-cranks are all there, and in splendid working order too. What shall it be? "Home, sweet home." Nothing can be better, or more cheering to us up here in this cloud-capped belfry, on this "terribly" cold winter afternoon. To be sure, when our work is over for the day, the warm and welcome hospitality of the Clergy House sends forth to us its friendly mandate that will brook no denial.

Hush! Whir-r-r! she is off. The last swing of the pendulum has caused the discharge weight to fall, slowly and measuredly giving out the four quarter chimes, followed by one, two, three sonorous blows on the fine tenor bell of one and a half ton weight, announcing far and near the hour of the day. Before the boom of the last blow has died away, the machine, without stopping, moves, for the succeeding performance. The pin-barrel to the suitable position, when sharply and distinctly chimes out on the crisp, frosty air the dearly-loved melody of "Home, sweet home!" There is music for you that is making a name for itself all over Derby, and a far wider reputation for its mechanism. There's a ping-panging, boom-banging overhead for you! Take your hauds down from your ears; it is beautiful! beautiful! And what is more, the poorest family within the sound of its voice can sit by their own fireside and enjoy this soft melody, "Home, sweet home!" These chimes will help to make this church a crowded and a well-nourished "institution" by-and-by, from humble pennies to golden pounds. Mind the "fly!" Look at the rate at which it is whirling. It is a dangerous customer to be within tapping distance of, and if it chances to catch you within any of its revolutions, you will long remember the contact. See into what shapeless and ugly form it has converted yonder new hat, unluckily brought within its reach. We cautioned the wearer, but a moment too late. It derives its great speed from the worm on its axis being geared into a skew-cut wheel, that is in quick motion behind the winding drum. Just come round here, and let me point out to you how everything works in unison to the desired end—harmony.

See how steadily the barrel revolves. No jumping or jerking forward, but, like an irresistible fate, the barrel-pins withdraw the triggers, each hammer-lever falls, and the required note is heard to sound on the bell above. The lifting-bar is instantly drawn into contact with the lifting lever, and the hammer-lever is again raised to the locked position ready for the next turn. As in the Weymouth machine, so here; the barrels which do the striking and musical work of the clock can be removed, one after another, and a barrel of changes put in. There is a barrel for this purpose, and by its means the machine has several times performed the unparalleled feat of chiming a touch of grandsire triples on eight bells—3126 blows, 392 changes with perfect precision in twenty minutes, or at the rate of three blows for every second of time! Such a performance has certainly never been known in this way before. What a vast difference between this and the old style of work. Should either you or your friends contemplate blessing any neighbourhood with a set of bell-chimes, you need be no longer in darkness upon the subject. "What a ding-dong the bells make with their eight hammers!" My dear friend, there are sixteen hammers at work, two to every bell. If you wish a nearer taste of their quality, just run up the stair-ladder there by the side of the wall, shoot your head into the belfry loft, and hear them give tongue at home; you will be delighted. "Lose your hearing!" Nonsense! You will return with a fine, well-attuned ear for chime music.

"Who is that gentleman entering the chamber?" That is the Rev. Mr. Lyall, the incumbent, to whom the church may be said to owe its existence. Although his natural temperament is thoughtful and grave, as becomes his sacred office, he is now smiling all over his face, and not only exchanging congratulations with every one around, but shaking hands with himself, so pleased is he with his new chimes. The gentleman speaking to him is Mr. Robinson, the diocesan surveyor, and the architect of the tower we stand in; but we will return to our machine.

As we were saying, you see the triggers jump backwards off

their ends of the levers. Now observe. The lever dips a little, and at that instant a bar of the steel cylinder below strikes into the half-moon end of the lifting-bar, when up goes this half of the lever and down goes the other, pulling the rope and striking the hammer on the bell. That being done, as the raised end of the lever falls to its place the very end strikes on the nose of the trigger-catch, forces it back on the flat spring behind it, when, after passing this nose-angle, the reaction of the spring instantly jerks the catch forward, and relocks the lever, until the next barrel-pin in its turn strikes the trigger, and lets the lever off again for the lifting-bar to be moved by the steel cylinder as before, and so on for every blow of every hammer on every bell.

"Click! Kritch-cht-cht-cht." That is the locking detent when the tune is played out, and the "Kritch" is the friction of the fly-vanes upon their shaft, after that shaft has been suddenly stopped with the rest of the machinery. It would not do to as suddenly stop the fly, or the shaft and gearing might break at some point or another. All these little things have to be foreseen and provided for.

The bells vary in weight, the largest being about one and a half ton. There are sixteen levers in at present, but the machine is constructed for twenty. Each lever has its own rope and hammer, so that the other four mean four more hammers and two more bells; in other words a chime-peal of ten bells, the mounting of which is merely a question for the liberality of those who take a pleasure in such pleasurable matters.

Every lever can be hooked down when not wanted to play, and each one can, also, be taken out for any purpose without disturbing any other; or, in fact, anything but itself and its own "belongings." The whole affair is so simple, when it is examined, that the wonder is it was never found out before—the wonder of many a valuable invention.

When the bell-ringers are at work, the whole of the chiming machinery can be at once thrown out of gear, and when required as quickly put to work again.

This machine has four barrels, three of them being set for sacred music only. One barrel can be taken out and replaced by another in a few seconds. Each barrel plays a number of tunes, changing by an end-way motion as each tune is finished, so that the director of chimes may have a relay of tunes at his disposal.

But there is a peculiar "faculty" to adapt a name for the occasion which this machine possesses that will be deemed of considerable value, and that cannot be passed over without due explanation. It is this. That a piano key-board, as shown in the drawing, can be attached to the machine, and then with his music book open before him, the performer can play what he pleaseth at his own sweet will!

Of course when that takes place the chiming-barrel is thrown out of gear, and instead of the pins letting off the triggers, that is done by the player upon the keys, by means of the rods which are seen in our wood-cut passing down at the back of the key-board to the barrel-end of the levers. With the exception of the chiming-barrel the other part of the machinery is at work to pull the hammers. Nor is there any laborious "fingering" involved, as might be supposed; for the triggers and levers are so nicely balanced, each to the other, that the finger-power that could manage a "brilliant-toned cottage" would, certainly, bring music out of the bells of St. Luke's. One of the musical treats of the locality would be, after duly announcing the fact, for some ambitious "Cecilia" to take her seat at the key-board, and astonish campanological Derby with her performances!

What next, and next?

A lengthened and interesting account of the subject will be found in Mr. George Lund's paper on "Bells and Modern Improvements for Chiming and Carillons," read before the Society of Arts, in 1874, which paper may be had at 42, Pall Mall.

The following are the tunes which the chime-machine of St. Luke's plays:—"Home, sweet home!" "The last rose of summer;" "The March in Scipio;" an original march composed expressly for the bells, by Mr. Housley, the organist of the church; the "Blue bells of Scotland;" "My lodging is on the cold, cold ground." Ancient and modern hymn-tunes: "O rest in the Lord!" "Paradise;" "St. Chad." Hymns 135, 18, and 298.

We have spoken of the ladies being always foremost in every good work. The church under notice has been the grateful recipient of their special favours. Miss Lucy Lonsdale, a daughter of the late bishop, presented a beautifully-wrought pulpit of white alabaster, having steps on either side. The ladies of the district, known as "the Clewer Sisters" gave some elaborate embroidery, and the Messrs. Bemrose, of Derby, the lecturer, whilst Mrs. Lyall, the mother of the rev. the incumbent, was also a valuable contributor.

But, in addition to all of these, Mrs. Moss, a lady well-known and highly respected in Derbyshire, made, what we can no less than term a right noble offering, a gift of the clock, the bells, and the chimes, which have formed the subject of this paper. The church is otherwise largely indebted to her munificence. We were not aware of these facts during our visit to Derby; but, being now in possession of them, we cannot refrain from making them public. What a large amount of happiness that one lady must have conferred upon that neighbourhood!

It is impossible to overrate the value of this great invention as it has been perfected by Messrs. Lund & Blockley. It is, in its superiority to the old wooden pin-cylinder, what the ancient clock of De Yick is to an astronomical regulator; or the one-hand verge "turnip" of our forefathers to the elegant, compensated, adjusted pocket instrument of the present generation. With the model in Pall Mall are a set of the new hemispherical bells, and those interested in such matters will have every information accorded to them by presenting their card. We understand that they have been hung for the machine in several turrets, and are giving much satisfaction. All the chiming machines and clocks are made at the clock factory in Great Pulteney-street, Golden-square. We have been there, and, amid lathes and cutting-engines, moralized over the changes of times and men that have produced a full-working, clock-making factory within little over five minutes' walk of St. James's Palace.

We must not omit to remind our readers that the machine that is capable of doing all that we have described in this paper only occupies a space, frame included, of 6ft. 6 in. by 4ft., and 4ft. high. As we have already explained, any comparison between it and the old style of machine is entirely out of the question.

We think that we have now said all that there is to say about this new chiming system. We are happy to hear that the character of unsurpassable superiority is rapidly spreading, and that orders for its adoption are being given "thick and threelfold." For ourselves, we have spoken as we have seen and examined; and our thanks are due for items of information to all the gentlemen whose names have already been mentioned. To sum up. Taking the church, the clock, and the chimes, they reflect lasting credit upon all the parties concerned in their construction, and upon the liberality of the founders of the sacred edifice.

The incumbent of St. Luke's, Derby, in his great desire to make his church not only all that a church should be, but even a model of its kind, has not overlooked the inestimable boon of correct time-keeping to the business of every-day life. Having settled himself in the midst of a large, suburban, working population, it is his intention, as soon as funds are at his disposal, to have a Greenwich time-wire attached to the clockwork, so that exact time—as that of the parent Observatory now rules over the country—may be struck on the great bell at prominent hours during the day. We believe we are pretty near the mark in stating that the cost would be about 30*l.* a year. It is a question entirely for the supporters of the church, and we hope that they will deal with it in a liberal spirit, as the money would be well laid out.

Of Mr. Robinson, the architect, it is no more than justice to say that, apart from the great beauty of the church itself, with which we are not now immediately concerned, the tower will command unstinted admiration, and stand as a lasting testimony to his already deservedly high professional reputation. In this we do not speak without our warrant, for Mr. Robinson has been the designer of many sacred edifices, and is looked up to as the chief ecclesiastical architect of the Midland Counties.

To the Rev. F. J. Lyall, M.A., our thanks are also warmly tendered, and we heartily congratulate him on the crowning success of his labours; and on the fact that he and his friends can point to a church of which any pastor, congregation, or town might well be proud.

EDE'S GOLD, SILVERSMITHS', AND JEWELLERS' CALCULATOR, which shows at sight the exact value of gold, silver, and diamonds, at any given price, has already reached its tenth edition, and the usefulness of its contents is fully evinced by the demand which exists for the work. Dealers in gold and silver, who are constantly in the habit of dealing in minute divisions and subdivisions of a particular weight, are peculiarly in want of an assistant similar to that which this work presents. Without it, their only plan is to adopt a lengthy and intricate calculation (on the spur of the moment), which is tedious and uncertain, and often devolves on persons not competent to it, resulting in loss of both time and property. With such an aid the calculator is always safe; he can refer to what he wants without delay, and with perfect confidence in the result. The present edition has been prepared with great care and accuracy.

THE PENDULUM.

IN a very able and interesting paper recently read by Dr. Auderson, C.E., F.R.S.E., before the Society for the Promotion of Scientific Industry, Manchester, he alludes to the pendulum as follows:—

"We are all more or less familiar with the pendulum, which is rather a natural fact than an invention. The pre-historic man in tying the string to the stone did not embody the idea of a pendulum; he had the pendulum in his hand every day, but he had not the capacity to observe its wonderful properties; just as it is with ourselves now in regard to other things, which are before our eyes waiting for some one to observe them with more insight.

"The pendulum is the best indicator of the progress of time which man has yet discovered. A cord of a given length will keep the same time, whether moving in a long or a short arc, within certain limits, yet the world went on for many thousand years before it detected this remarkable property. The great Galileo, while still a young man, was the first to observe the fact from the swinging of a suspended lamp in the metropolitan church in Pisa, and which he afterwards confirmed by experiment.

"From that time until now the pendulum has been the chief feature of an ordinary clock. In the clock, however, the pendulum has no real work to do, it swings in its own way and keeps its own time, and is independent of man for its good behaviour. It would go on swinging for ever, except for the frictional and other resistances that it meets with; the mechanism of the clock merely marks the time kept by the pendulum, while the force required to keep matters going is the earth's attraction, due to the gravity of a weight.

"In the course of time, James Watt, in seeking for a regulator to his steam-engine, pounced on the pendulum, but he was not able to apply it in all its innate simplicity. At length his deductive mind conceived the idea of a double pendulum, united at the top, and made to revolve instead of to swing, so that centrifugal force would step in, and he would thus secure all the pendulum advantages by the modification. In the clock the pendulum has merely to swing, but Watt gave it a new office—perhaps not quite so dignified as the former, for it now had to act as a porter—to open and close a door for the admission of steam, as the engine went too fast or too slow.

"An idea once fairly got hold of in the practical world is seldom lost to mankind. A quarter of a century passes by, when a step of promotion opens up to the pendulum. It was made a monitor to a water-wheel, and, after passing through the fertile minds of Rennie, Fairbairn, Hughes, and Wren, Watt's governor assumed an entirely new character. It was now released from the task of opening and closing the ponderous door which admits the water to the wheel; it had to act as an adviser only. It had a small room or office set apart for its own use, where it could watch and think, without disturbance. Two orderlies, in the form of bevel wheels, were stationed alongside, whose duty it was to transmit the messages of the pendulum to the water-wheel, telling the wheel how to correct its own error when going either too fast or too slow.

"Half a century rolls on, when a much higher duty opens up before the pendulum in connection with the regulation of certain steam-engines now extensively made in Lancashire. This new regulator not only does all that was done in the earlier engines, but, in addition, it takes into consideration the exact amount of work which is being done at each moment: it takes note of the pressure of steam, of the value of the vacuum in the condenser, then, by a recondite reasoning process, it is able to determine the exact point when it dare venture to cut off the supply of steam, so that the utmost effect may be obtained by expansion, and along with that the utmost economy of fuel. We thus see the material embodiment of ideas to perform a reasoning process, which neither the man who first conceived the idea, nor any number of men assisting him, could perform in the same space of time."

MORRISON'S GOLD AND SILVER SOLUTIONS, for electro-plating without a battery, are being extensively used and seem to meet with general favour. From the terms in which we hear them spoken of it may be predicted that ere long they will be universally adopted. The solutions are made from pure gold and silver, and, by dispensing with the use of the cumbersome battery, any jeweller may regild his articles in a very simple and inexpensive manner. They seem to require no elaborate preparation for use, but are easily applied, and impart a uniform and substantial look to all the articles treated. Full directions accompany each bottle, and from the reports which have reached us we feel every confidence in recommending them. The general agency is at Horwitz & Co.'s Material Depot, 42, Hatton-garden, London.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

400. LIONEL COHEN SPIERS, of the firm of D. and L. Spiers, of Birmingham, in the county of Warwick, Manufacturing Jewellers, for an invention of "Improvements in rings, slides, or fastenings for scarfs, victorines, and other like articles of dress."—Dated 1st February, 1876.
436. GEORGE HAYTER CHUBB, of 57, St. Paul's Churchyard, in the city of London, for an invention of "Improvements in safes and strong rooms."—Dated 3rd February, 1876.
464. THOMAS JAMES SMITH, of the firm of Robertson, Brooman, and Company, of 166, Fleet Street, in the city of London, Patent Agents, for an invention of "Improved means and apparatus for setting or regulating calendar watches."—A communication to him from abroad by Louis Joseph Crozet, of Rue des Halles, Paris, in the republic of France.—Dated 4th February, 1876.
483. HERBERT JOHN HADDAN, of the firm of Herbert and Company, Patent Agents, of 67, Strand, in the city of Westminster, Civil Engineer, for an invention of "Improvements in solar chronometers."—A communication to him from abroad by Marshall Wheeler, of Big Rapids, Michigan, United States of America.—Dated 7th February, 1876.
520. GIUSEPPE ZAFFIRA, of Pentonville Road, in the county of Middlesex, Engineer, for an invention of "Improvements in watches, clocks, and chronometers."—Dated 9th February, 1876.
564. JEAN RUCH, of Paris, France, Merchant, for an invention of "A new or improved process for extracting precious metals contained in the ingots, the ores, the matts, the goldsmith and silversmith ashes, the wastes of all kinds, and also in the residues of the amalgamation."—Dated 11th February, 1876.
697. JOHN COMPTON WEEKS JEFFERYS, Manufacturing Jeweller, 14, Tottenham Court Road, in the county of Middlesex, for an invention of "An improved fastening for jewellery and articles of dress."—Dated 19th February, 1876.
720. THOMAS RICKETT, of Birmingham, in the county of Warwick, Manager of Works, for an invention of "Improvements in sleeve links, solitaires, and other like fastenings for articles of dress and jewellery."—Dated 21st February, 1876.
760. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an invention of "An improved machine for cutting diamonds and other precious stones."—A communication to him from abroad by Henry D. Stover, of the city and state of New York, United States of America.—Dated 23rd February, 1876.

Grants of Provisional Protection for Six Months.

483. To HERBERT JOHN HADDAN, of the firm of Herbert and Company, Patent Agents, of 67, Strand, in the city of Westminster, Civil Engineer, for the invention of "Improvements in solar chronometers."—A communication to him from abroad by Marshall Wheeler, of Big Rapids, Michigan, United States of America.

Notices to Proceed.

3437. EDWIN CALDICOTT, of Birmingham, in the county of Warwick, Engraver, "An improved earring fastener and protector."
3662. WILLIAM JEPHCOCK, of Birmingham, in the county of Warwick, Watch Maker, has given notice in respect of the invention of "Improvements in the cases of watches, clocks, time-pieces, locket, and other similar articles."

Patents Sealed.

2827. ROBERT WHARTON PARKIN, of Sowerby Bridge, in the county of York, Safe and Lock Manufacturer, for an invention of "Improvements in locks for 'safes,' strong rooms, and other purposes."—Dated 11th August, 1875.
2969. FRANCISCUS XAVIER FERDINANDUS HEILBORN, of Birmingham, in the county of Warwick, Jeweller, for an invention of "Improvements in fastenings for articles of dress and ornaments and in locket and ornament suspenders."—Dated 24th August, 1875.
4333. MARLUS ANTHONY PRADIER, of 7, Bedford Street, Bedford Square, in the county of Middlesex, Manufacturing Jeweller, for an invention of "A new and improved method of fastening and unfastening the shirt collar or other stud, sleeve-link, and solitaire, by means of the screw principle."—Dated 14th December, 1875.
2917. ALFRED JOHN HIGHAM, of 13, Blackheath Terrace, Blackheath, in the county of Kent, Gentleman, for an invention of "Improvements in clocks and other timekeepers."—Dated 18th August, 1875.

Patents which have become Void.

295. WILLIAM EDWARD GEDGE, of 11, Wellington Street, Strand, in the county of Middlesex, Patent Agent, for an invention of "Improvements in chimney and other clocks, for the purposes of alarm."—A communication to him from abroad by Auguste Pasquier, of Chateau-Gontier (Mayenne), France, Clockmaker.—Dated 25th January, 1873.

Patents Granted in British Colonies and Dependencies.

CANADA.

- No. 5309. JOSEPH W. BRANCH, of Saint-Louis, Mo., U.S., for "A method of inserting, fitting, and securing diamonds in metallic holders for working in stone." (*Manière d'enfoncer, ajuster et assujettir les diamants dans des manches métalliques pour travailler la pierre.*)—5 years.—Dated 30th October 1875.—*Claim.*—"1st, the process of inserting, fitting and securing diamonds into metallic holders by softening the holder or holders with heat, and then pressing the diamond into the metal, which afterwards in cooling contracts upon the diamond. 2nd, the described process of enveloping diamonds in heated metal, and subsequently by any suitable means such as grinding, removing the surplus metal and exposing the cutting point of the diamond. 3rd, a metallic diamond holder or tool having the diamond imbedded or inserted while the metal is softened by heat."

Patents Granted in Foreign States.

UNITED STATES.

- No. 171,496. RANDAL T. ANDREWS, of Thomaston, Conn., assignor to the Seth Thomas Clock Company, of the same place, for "Lock-work attachments to clocks."—Application filed 7th December, 1875.—*Brief.*—"When the hands are turned backward a recess in the shaft receives the lifting-lever, thus releasing it from the action of the locking-pin."
- No. 171,583. ALBERT SCHMIDT, of Brooklyn, N.Y., for "Clock striking mechanisms."—Application filed 1st December, 1875.
- No. 171,681. GUSTAVUS MEYER, of Quincy, Ill., assignor of one-half of his right to Julius Franke, of the same place, for "Spectacle-holders."—Application filed 1st October, 1875.
- No. 171,723. WILLIAM HAGERTY, of Monongahela city, Pa., assignor to himself and John Corey, of the same place, for "Fire-proof safes."—Application filed 12th November, 1875.—*Brief.*—"A safe constructed with inner and outer communicating water-chambers, having inlet and outlet pipes, so arranged that the water flows first into the inner chamber, thence in the outer chamber, and out through the outlet-pipes."
- No. 172,165. MATHIAS PETERSEN, of Altona, Prussia, for "Chronometer-escapements for watches."—Application filed 3rd April, 1875.—*Brief.*—"A locking-cylinder used in a detached escapement in place of the detent-spring."
- No. 172,182. GUSTAV ADOLPH SCHULTZ, of Louisville, Ky., for "Watchmen's detectors."—Application filed 28th July, 1874.

AUSTRIA.

90. L. J. ROTH, of Vienna, for "Rotary hammers with stop-hooks for clock-work."—1 year.—(Public.)—Dated 11th August, 1875

Patents Cancelled in Foreign States.

1. C. PIEPER, of Dresden, for "A regulator for spring watches."—Dated 26th October, 1874.—(Cancelled 7th January, 1876.)

Designs Patented in Foreign States.

UNITED STATES.

- No. 8871. SHUBAEL COTTLE, of New York, N.Y., for "A bead for a necklace."—Application filed 27th November, 1875.—Term of patent 3½ years.
- No. 8878. SIMON PFAELZER, of Philadelphia, Pa., for "A breast-pin."—Application filed 27th November, 1875.—Term of patent 3½ years.
- No. 8885. WILLIAM H. HALSEY, of Newark, N.J., for "A breastpin."—Application filed 16th December, 1875.—Term of patent 3½ years.
- No. 8888. ALBERT H. POTTER, of Chicago, Ill., for "Watch-plates."—Application filed 11th October, 1875.—Term of patent 14 years.
- No. 8895. FRANCIS DIMIER, of New York, N.Y., for "A necklace."—Application filed 13th December, 1875.—Term of patent 3½ years.

Trade Marks Registered in Foreign States.

UNITED STATES.

- No. 3295. JOHN GORDON, of San Francisco, Cal., for "Watches and other time-pieces."—Application filed 23rd October, 1875.—"Word 'Hermetic.'"

HOROLOGY.

HOROLOGY has enabled us to discover that when the wind passes at one mile per hour it is scarcely perceptible, while at the rate of 100 miles per hour it acquires sufficient force to tear up trees and destroy the produce of the earth; and, without the aid of a seconds clock, it would have been scarcely possible to ascertain that a cannon-ball flies at the rate of 600 feet in a second.

THE Watchmaker, Jeweller, and Silversmith,

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OUR ILLUSTRATED SUPPLEMENT.

WITH the present number we have the pleasure of again presenting our readers with an illustrated supplement showing the designs and workmanship of PENDANTS and a CHATELAINE exhibited in the Paris Exhibition, 1867.

The two pendants represented at top are the work of, and were exhibited by M. O. Massin, who ranks high among the famous jewellers of Paris. They are examples of the purest and best Art exquisitely designed and finished.

The CHATELAINE of gold is the work of, and was exhibited by, M. Boueheron, who received the highest honour the Exhibition could accord to that eminent goldsmith. It will be found a rare specimen of Art-manufacture.

The two pendants at foot of page were exhibited and manufactured by M. Fontenay, of Paris, whose exhibits were among the most refined, beautiful, and costly of their class, possessing unusual grace and excellence as works of Art. The ground is jade, the birds and drops being of diamonds and rubies. Altogether, our supplement will be found valuable for the Art suggestions which it presents.

EXHIBITION OF WATCHMAKERS' AND JEWELLERS' WORK.

WE learn from the *Horological Journal* that a competition in workmanship, open to all practical watchmakers, clockmakers, and jewellers, in Forfarshire, will be held in Dundee on the 8th of March next, under the direction of the Dundee Association of Watchmakers and Jewellers. Three prizes are offered for competition among journeyman watch and clock-makers; six prizes among apprentice watch and clock-makers; two among journeyman jewellers; and four among apprentice jewellers. The value of the prizes and all information may be obtained from the secretary, Mr. Geo. Johnson, 20, Panmure-street, Dundee. Such exhibitions have a very great and beneficial influence, both by encouraging the best efforts of workpeople and drawing general attention to the work. We hope to give full particulars of the articles exhibited.

In view of the considerable increase in the number of thermometers and barometers sent to the Kew Observatory for verification the committee have determined to open an office in London, for their reception, so that opticians may avoid the trouble hitherto experienced in sending them to Kew. This step will be found of considerable convenience to opticians and others.

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Adjudications of Bankruptcy.

BROWN JAMES, High-street, Spennymoor, Durham; jeweller. Feb. 18. At C. C. Durham. Mar. 7, at 11. Marshall, Registrar.

GENESE SAMUEL, 18 Daulby-street, Liverpool, travelling jeweller. Feb. 22, at C.C. Liverpool. Mar. 7, at 2. Watson, Reg.

JAVAN HENRY W. P., 18 Lever-street, Goswell-road, jeweller. Feb. 23, at Bankruptcy Court, Lincoln's Inn Fields. Mar. 6, at 12. Murray, Reg.

RAMS WILLIAM C., Devonshire-street, Islington, jeweller's factor. Feb. 22, at Bankruptcy Court, Lincoln's Inn Fields. Mar. 13, at 11½. Murray, Reg.

Liquidations by Arrangement or Composition.

BERNSTINE MORRIS, Gilkes-street, Middlesborough, jeweller. Feb. 24, at J. H. Draper's, solicitor, Stockton. Mar. 10, at 3.

BROWN JAMES, High-street, Spennymoor, jeweller. Feb. 1.

COHEN JACOB, Waterhouse-lane, and Savile-street, Hull, outfitter and jeweller. Feb. 3.

COMPTON SAMUEL, Frome, Somerset, jeweller. Feb. 7.

FRANK JACOB, Mill-street, Pontypridd, watchmaker. Feb. 4.

GLEAVE WILLIAM, Swan-street, Manchester, watchmaker. Feb. 18, at Ryland and Barners', solicitors, 2 Essex-street, Manchester. Mar. 9, at 3.

GLEAVE WILLIAM, Swan-street, Manchester, jeweller, at the Queen's Hotel, Birmingham, in lieu of the place originally named. Mar. 9.

GOLDBERG ALEXANDER, Aberdeen-street, Oxford-road, Chorlton-upon-Medlock, Manchester, travelling jeweller. Feb. 21, at C. Nuttall & Sons, solicitors, John Dalton-street, Manchester. Mar. 9, at 2½.

HAMPTON DANIEL, and ROBERT HAMPTON, trading as HAMPTON BROTHERS, Darlington jewellers. Feb. 15.

HARRINGTON ALFRED, Aldershot, jeweller. Feb. 15.

HENSCHER SIMON, Harold-street, Sunderland, jeweller. Feb. 2.

LEWIS ABRAHAM, Westgate-road, Newcastle, jeweller. Feb. 8.

MORRIS JOHN, Commercial-road, Newport, jeweller. Feb. 16.

PRICE DANIEL, 33 Balsall Heath-road, Birmingham, jeweller. Feb. 15, at A. H. Foster's, solicitor, 13 Bennetts Hill, Birmingham. Mar. 14, at 11.

SCHINDLER MAURICE, Meadow-street, Sheffield, jeweller. Feb. 4.

SPENCER THOMAS JOHN, trading as THOMAS SPENCER, 11 Myddleton-place, St. John's-street-road, goldsmith and jeweller. Feb. 11.

WETZLAR GEORGE, 7 Marlborough Villas, Marlborough-road, Dalston, diamond merchant. Feb. 8.

Dividends Under Sequestrations.

LEWIN WILLIAM, (Liq.), Grosvenor-street, Bond-street, and St. George's-road, Piccadilly, jeweller, 2nd div. 1s. 6d. H. H. Ashworth, 3 Salters'-hall-court, Cannon-street.

MOSS MARCUS SLAZENGER, trading as MARCUS S. MOSS & Co., 59 Corporation-street, Manchester, jeweller, 2nd and final div. 2s.; C. Taaffe, 44 Northampton-street, Birmingham.

ROWNTREE THOMAS, Scarborough, jeweller. Div. 1s. 4½d.; J. G. Hart, Huntriss-row, Scarborough.

Dissolutions of Partnership.

CAMERON JOHN & SON, King-street, Kilmarnock, watchmakers and jewellers. Nov. 3. Debts by John Cameron, who continues the business.

GILBERT & PINDER, watchmakers, Bolton.

JONES & WALKER, electroplaters, Birmingham.

Bankruptcies Annulled.

WOLFE JACOB, (Nov. 10) Leeds, York, jeweller. Feb. 23.

Bankrupt to Surrender.

SPENNIMOOR James Brown, jeweller. March 7, at Durham.

Scotch Sequestration.

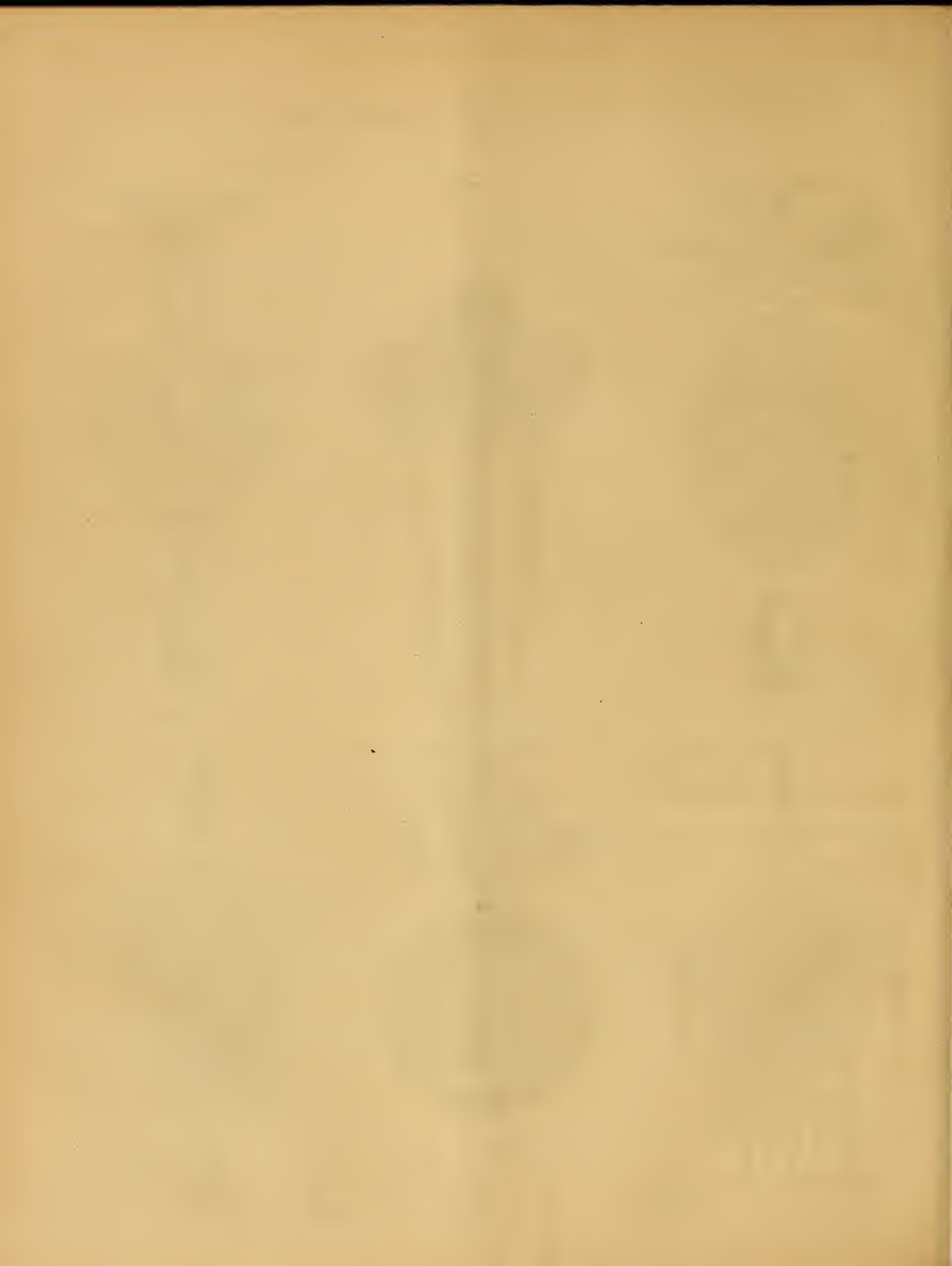
CALDENBACH CHARLES, Dundee, watch and clock maker. Feb. 22, at the British Hotel, Dundee.

Last Days for Lodging Claims.

ETCHISS WILLIAM, (Liq.), George-street, Altrincham, watchmaker, claims by Mar. 11 to Peter Bates, Vernon-street, Stockport, Accountant.

Supplement to the "Watchmaker, Jeweller, and Silversmith."





AN ACCOUNT of the declared Real VALUE of the IMPORTS and EXPORTS of GOLD and SILVER BULLION and SPECIE Registered in the Month ended 31st January, 1876, compared with the corresponding Period in the Year 1875.

GOLD.

SILVER.

COUNTRIES.	IMPORTS.		EXPORTS.		IMPORTS.		EXPORTS.	
	Month ended 31st January.		Month ended 31st January.		Month ended 31st January.		Month ended 31st January.	
	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.
	£	£	£	£	£	£	£	£
RUSSIA	...	...	...	...	...	...	...	...
SWEDEN	...	...	...	...	...	...	...	...
GERMANY	691	100,240	...	302,000	485,885	104,450	...	17,835
HOLLAND	21	100	2,500	330	160	...	2,800	3,100
BELGIUM	7,952	458,594	189,800	10,455	750	5,164	46,900	17,710
FRANCE	83,852	24,928	200,216	897,247	68,881	118,720	263,306	247,453
PORTUGAL	...	...	...	...	...	...	...	...
AZORES	...	...	...	7,700	...	500	...	6,525
MADEIRA	...	...	...	...	...	...	...	...
SPAIN and CANARIES	...	...	...	...	142	...	60,530	12,100
GIBRALTAR	3,340	14,667	...	...	2,288	6,045	...	...
MALTA	4,250	150	600	35,000	2,700	...	5	5,000
EGYPT	...	60	...	...	1,615	370	...	...
WEST COAST OF AFRICA	8,630	13,374	592	2,142	3,393	637	2,029	2,950
BRITISH POSSESSIONS IN SOUTH AFRICA	9,044	68,559	...	...	35	200	...	...
BRITISH INDIA	10,300	2,890	3,821	5,408	10,300	8,496	533,250	279,030
CHINA (including HONG KONG)	500	46,813	...	...	6,943	2,952	6,565	60
JAPAN	307,957	39,332	...	...	...	2,876	...	...
AUSTRALIA	497,203	253,687	...	...	5,779	1,192	...	...
BRITISH NORTH AMERICA	...	...	...	...	...	1,400	...	...
MEXICO	...	...	...	...	...	...	...	...
SOUTH AMERICA (except Brazil) and WEST INDIES	85,611	19,983	88,880	139,600	408,904	196,812	500	35,821
BRAZIL	29,550	46,766	201,494	5,860	5,840	220	...	...
UNITED STATES	1,160,232	5,757	2,800	...	224,963	151,239	...	...
OTHER COUNTRIES	31,955	84,400	500	56,000	6,031	36,240	...	11,450
Total Value of £	2,241,088	1,179,800	691,203	1,461,742	1,234,609	637,513	915,885	639,034

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WEBSTER, J., 88, St. John Street Road, Clerkenwell, E.C.

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A MONTHLY TRADE JOURNAL,

Devoted to the Interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades.

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HOROLOGICAL.

(Continued.)

XI.—DIALLING.

IN our last article we mentioned the surprise that the reader would be likely to experience upon having found that he had constructed a horizontal dial on the uppermost face of his pentagon. We will now pass to what, for the sake of plainness, we will call the sloping face on the right-hand side. We are endeavouring to steer as clear of geometrical expression as our subject admits of, because we are not writing for geometrical readers; indeed, were that so there would be very little occasion for us to write at all.

On the front face of the block draw two lines parallel to the boundary one of the uppermost face already mentioned. These lines will form a parallelogram across the face of the block, and will bound the right and left upright sides. We will letter the upper line, E—M; and the lower one, F—L. We will now turn our attention to the "plane," or right-hand sloping face of the octagon, and mark its four points as B C M N. This plane will make an angle with E M, the upper front face horizontal line, which angle, or slope of the said plane, may be designated as C M E, will represent the line of elevation of the pole. Having got these matters correctly drawn, we thus go on:—

On the plane under notice draw a right line across the lower part to represent the horizon, which mark as a—b. Next draw a meridional line at right angles through the centre of the horizontal line, and write c e. Mark where these two lines bisect each other. On the upper part of the plane draw a second horizontal line f g.

We will just look over the work to satisfy ourselves that we are going on correctly; for, to a person not used to these things, the "a b c's," and the angles and parallels, are apt to be a little puzzling at first.

We will now direct attention to the meridian down the centre of the two parallel lines already mentioned, and, as in a former method, divide that line into an upper and a lower half. With the compass point extended to the distance of one of these halves, carefully draw a quadrant. You have now got hold of your key, because by subdividing the quadrant into six equal parts you obtain your hour-lines, as on previous occasions. You next number off these hour-lines, taking the meridional one as noon. Before you go further, you will, where the quadrant lines touch the lower horizontal line, construct parallel lines, connecting the upper and lower horizontals, or E M with F L. Having done this, you will at the extremities of these parallels, or perpendicular lines, mark the hours, beginning, as has just been said, with noon on the meridional. To endeavour to make the matter still plainer, let us mark, say, 12 o'clock at the lower end of the meridian; then we must also mark 12 at the upper end, and so on, 1, 2, 3, 4, 5, 6, to the right hand. To the left, from 12, we mark 11, 10, 9, 8, 7. The concluding work is to fix a style upright on the face of this dial to throw the shadow on the hours; this style is to be of a length equal to half that of the meridional line. This, under a new form, is an upper polar dial.

We will shift our ground and go to the face of the octagon on the left-hand side, which we will distinguish by the letters A at the backmost angle, D at the upper front one, and E where it already stands at the end of the upper parallel line that goes across the front face of the block. The angle that D E makes with the line E M is equal on the slope of E D to the elevation of the equator. We next

describe a circle on this face of the octagon, and across it each way—side to side, and top to bottom—draw two diameters intersecting each other at right angles. One of them, the last-named, will be the line of the meridian, which, with that across, will divide the circle into quadrants. Now take each quadrant and subdivide it into six equal parts from the centre of the circle, and we get the hour-lines. These lines we number off in the usual way of 12, 1, 2, 3, 4, 5, 6, 7, 8, to the left for the afternoon, and 12, 11, 10, 9, 8, 7, 6, 5, 4, for the morning sun. Consequently, as each division, it is borne in mind, represents fifteen degrees of the sun's course, they represent an hour in time; therefore, in summer, the hours will be shown from 4 o'clock in the morning until 8 o'clock in the evening. This construction will add an upper horizontal dial to the octagon block, after placing upon it a style in the form of a pin through the centre of the circle, this pin being of the height of the length of the line E D, and perpendicular to the plane of the circle upon which it stands.

We next proceed to that side of the octagon, on our right hand, that is bounded by the extremities of the two horizontal lines across the front face marked M L, or the straight up and down side that lies between the two slopes. We will describe this plane in this way. Let it make, with the lower horizontal line, an angle at L down to H, the lower point of the slope adjoining the base of the octagon. This angle will be equal to the elevation of the equator, then proceed as follows:—First of all, draw a meridian line, marked A B; between these extremes mark another distance, and call it C. From C horizontally strike a line, marking it D. You will then have an angle, C a D, equal to the elevation of the equator. Draw another line from A to D, which will make another triangle, a, C, D, equal to the elevation of the pole, and make the angle, or, rather, triangle, equal to the elevation of the equator, and take care that D E cuts the meridian in E. Again, through the last-named central point, draw a horizontal line and mark it G H. Now take E B, equal to E D, and with that radius describe a quadrant, marking it E F. From the upper extremity of the meridian, as a centre, describe a small circle. From the centre B, with the radius B E, describe a quadrant, of which the horizontal line will be seen to be B F. From B, again, at equal distances through the quadrant, draw right (straight) lines, cutting the great horizontal line G H. Mark the intersecting points B a, B b, B c, B d, B e, and B f. Take the same distance as E a, and, on the left-hand side of the meridian, mark off the spaces E c, E f, E g, E h, and E i. The next thing is, from the small circular point at A, draw a series of right lines on both sides of the meridian, taking care that they cut, or intersect, the exact points where the quadrantal lines pass through the great horizontal G H. These latter-drawn lines will mark the points where the hours are to be engraved. Through the centre A, as a horizontal, draw another line, and next begin to mark the hours. At the lower end of the meridional line will be 12, then, on the left-hand side, go on with 1, 2, 3, 4, 5, 6, 7, 8 in the evening. On the right-hand side mark 12, 11, 10, 9, 8, 7, 6, 5, 4. The reader may ask, How do we find the hours after 5 in the afternoon, and before 7 in the morning, which are provided for by the bisection of the great horizontal by the quadrantal lines? Well, it is simple enough, like anything else, when you know it. Take the hour-line of 4 in the afternoon, and prolong it through the centre of A to the edge of the octagon plane. The opposite point will enable the style to show 4 o'clock in the morning; 5, the after 5 o'clock line; 6 in the morning, the 6 o'clock line; 6 in the 7 o'clock afternoon line, that of 7 o'clock in the morning. The style that is to be set up is that described by the angle C a D, which, as has been stated, is equal to the elevation of the pole.

This will constitute what we call our "octagonal" south dial; but, in order not to lose anything in the way of utilizing our planes, we will now proceed to the opposite space on our left-hand side, that one answering to where we have just been working, and see what account we can turn it to.

The first thing that is to be done is to accurately "square" the face of the octagon, as far as a good T, which can be easily borrowed from any friend who may be engaged in mechanical drawing. The next is, down the centre of this square produce the meridional line, and at the lower extremity of it construct a small circle, making the point of the line the centre of the circle, and mark that centre A. At this point make an angle, drawn from previous practice, equal to the elevation of the equator, by drawing a short line at right angles to the meridional, marking the meridional point of that line C, and its farther point D. Next join D to A, and you have the angle required. From D, again, make another angle joining the meridional line in the opposite direction, which angle is to be equal to the one just completed, marking it E D. Take a distance, double the distance from A, make a prick with the com-

pass on the meridian and call it E. At the point E, and through it as a centre, draw a straight line across the face of the octagon, which line may be marked as O O. Midway between A and E take a centre and describe a quadrant on the left-hand side, which divide, as usual, into six equal parts; through the two divisions next to the horizontal line of the quadrant draw lines from the centre B that will cut the long horizontal above, and mark the ends as B d and B o. Continue with the ruler from the circular centre A, and produce a line bisecting B d at their point in O O'. Do the same on the left-hand side at O', when both sides will be found to be alike. On the lower edge of the plane make use of the squaring-line to be found there by marking at each extremity of that line the figures 6, 6. Continuing this on the left-hand side, at the points where the oblique lines from A enter through that side of the square, mark 7 and 8. Then turn to the right-hand side, and from the 6, where the lines cut in a similar manner, mark 5 and 4. Having now done all our marking, we make an oblique index exactly equal to the slope of A D, that shall, when fixed, from A make the triangle A D E with the meridian line, in the plane of the meridian equal to the elevation of the equator. If this cannot be readily done, fix an upright index at C equal to the distance from C to D, or, if preferred, make a triangular plate to rest on the meridional line from A to E, and that shall be of the angular inclination of A to D and D to E. Then will A4, A5, A6, be the hours of the forenoon; and, according to the same principles, A6, A7, A8, will be the hours of the afternoon. We have now an octagonal north vertical dial.

As circumstances may, however, arise in which a southern form would be of more service, we will mention shortly how that may be constructed.

Down the centre, as before, draw the meridian; but in this case we must reverse some of our positions, and call the upper portion of the meridional line A. We then, according to the size which we intend the dial to be, take an interval at pleasure with the compasses, say, from A to C; we then, in the same way, draw a straight line across from C to the right, and mark the point D. With the lines from A to C, from C to D, and from D to A, what is called in geometry a right-angled triangle, which gives us the elevation of the equator, join A to D. We have, now, two right-angled triangles divided by the line from C to D. Where the line D cuts the meridian at E make it the central point through which to construct a horizon, as in the last dial, from left to right. Take the distance E D, and with it, on the meridional line, mark another point, calling it B; also, with the same distance construct another line to the right, and mark it T. We have, again, with E B and B F, another right-angled triangle. This triangle is the one upon which the quadrant has to be formed and divided, as before, into six equal parts. The rest is all plain, as well as plane, to try a mild geometrical joke—the rest is all plain sailing. The hour-lines are to be ruled off from through the points of junction of the lines of the quadrant with that of the horizon, and numbered off, the morning to the left and the afternoon to the right.

THE SICKER SAFE AND STRONG ROOM COMPANY, LIMITED.—On Saturday afternoon, the 18th ult., this company went through the ceremony of "steaming the boiler" at their new and extensive works at Soho, which they enter upon this week. It being an occasion of some moment to the employés, they were invited by Mr. J. Felton Elwell, the managing director, to be present. Having inspected the offices, show rooms, workshops, &c., they assembled round the engine, a splendid example of Messrs. Tangye Brothers' horizontal, which firm has also supplied the shafting and other portions of the machinery. Mr. George Joseph Smith, the chairman of directors, then went through the process of "turning on the steam," prefacing the operation with a few appropriate and felicitous remarks addressed to the men. All having gone satisfactorily, the visitors adjourned to a neighbouring tavern, where ample justice was done to a repast provided. The usual loyal and other toasts for the success of the company having been heartily received, a pleasant evening terminated.—*Birmingham Morning News*.

A VERY good impression of any article of metal having a flat ornamented surface may be taken by wetting some note-paper with the tongue and smoking it over a gas-flame. The article is then pressed upon the smoked part, when, if the operation be carefully conducted, a clear impression will appear. This can be made permanent by drawing the paper through milk, and afterwards drying it.—*Scientific American*.

HALL-MARKING OF JEWELLERY.

THE following paper on the Hall-marking of jewellery was read by Mr. Alfred Lutschaunig before the Society of Arts, at its fourteenth ordinary meeting on the 8th ult:—

"The paper I have the honour of reading to you to-night, on the subject of Hall-marks, has for its object, not merely to lay before you the general outlines of the system at present in operation, but also to make some remarks on the manufacture of jewellery, and the abuses which are practised by unprincipled manufacturers and traders on the ignorance and good faith of the public. The subject, though at first sight insignificant, assumes, when carefully looked into, great importance, and culminates, when thoroughly examined, into a veritable national question, as I shall endeavour to show further on.

"I shall also, after touching upon all points, propose the outlines of a new system, which should take the place of the old one, and this, I believe, will form the debatable ground. We all know that the love of ornamentation is a passion which has to be gratified, and we cannot say to the public, 'If you are not satisfied with what is offered to you in the way of jewellery, do without the gewgaws.' The craving after ornamentation is almost a vice. The passion can be traced back through all ages, and to all nations, whether savage or civilized, in all countries, and in all climates. Naked humanity ornaments its skin; dressed humanity adorns its dress. But nature in all cases, according to the views of humanity, requires a little touching up. This admitted, then, that ornament, and particularly gold ornaments, are absolutely necessary to the well-being of society, let us examine them. I have but a short time allowed me this evening, and I can only just lightly touch upon every point. The main and principal object of this paper is, after showing up the actual state of the jewellery trade, and proving, if possible, the thorough inadequacy of the present system of Hall-marking, and the action of the Goldsmiths' Company as a protection to the public, to excite a discussion which may lead to a remodelling of the at present existing state of things.

"Of the ten assay towns of the United Kingdom, we may safely say that three or four almost monopolize the marking of the whole of the jewellery manufactured in this country, and, when we consider what millions of articles are produced, it is at once evident that each article cannot be properly and separately examined. The moment we admit this fact, we also admit that a system requiring a separate examination of every small object, and a separate stamping, say, even of every link of a chain, is a thing impossible, and must, sooner or later, make way to a simpler and more efficacious system, embracing the whole of the goods, large and small, manufactured of gold and silver. We will say nothing of the great temptation to forgery which the present system affords, and which is so common that the Hall-mark is as good as no guarantee at all. The Goldsmiths' Company hardly ever prosecutes; there must be an instinctive dread of touching upon this tremendous question. It feels that if the question were once fully started, it could not face the astonished and indignant British public.

"Then, as if to invite and make forgery easy, and bewilder the public, look at the extraordinary varieties of marks which we have here represented. You see it requires a special study to understand them. Of course, when the marks are genuine, the parts on which they are struck are also of the quality indicated by the marks. I do not wish to attack the honesty of the assay, but then there is no safeguard against what is called transposition and addition. The piece of metal immediately adjoining the piece marked may be of a different quality altogether. There was a letter in the *Times*, only a few days ago, from 'A Bond-street Goldsmith.' It is quite short, and I will read it, as it confirms what I say:—

"Permit me to say that I must heartily endorse the remarks in your leading article on Mr. Gladstone's speech relative to the duties of our great City companies. Surely, after such a note of warning, the masters and wardens of the various guilds will put their 'shoulders to the wheel.' Foremost among them ought to stand the Goldsmiths' Company. Their charter gives them power 'to send wardens from shop to shop among the goldsmiths, to assay if their gold be of the touch specified in the statute.' If they would but exercise this privilege, and visit all shops occasionally, the public would benefit immensely. Frequently goods are brought to me stamped 18 carat, maker's mark, &c., under an impression that they are Hall-marked, but they in reality are only colourable imitations, base metal invariably being found between the gold parts. So extensively is this practice carried on, that there are hundreds of watch-chains now in circulation, one link bearing the mark 18 carat, the next link, not marked, quality about 6 carats; and so on throughout the chain. It is impossible for the public generally to detect these frauds, and I assert that it is, therefore, the absolute duty of the Goldsmiths' Company to search out and

prosecute all and any person making, selling, or otherwise disposing of such spurious articles. I trust some real good in this direction may yet be effected by the Goldsmiths' Company.'

"Then, there is another complaint against the present method of Hall-marking; the punches are clumsy, and spoil and disfigure the work—can, in fact, not be used at all on fine work. Watch-case makers have frequently told me that they have sometimes the greatest trouble in flattening down the metal that has been made to project by the rough use of the punch. A delicate outline punch would be far preferable.

"You are aware that the Goldsmiths' Company recognizes three lower standards and three higher standards.

The numbers	9 = 0.375 = 37½	per cent. of gold.	
12 = 0.500 = 50	"	"	
15 = 0.625 = 62½	"	"	
18 = 0.750 = 75	"	"	French, 0.750
20 = 0.833 = 83⅓	"	"	0.840
22 = 0.917 = 91⅓	"	"	0.920

"If we examine these figures in another way we find that, though in decimal form, and in the form of per-centage, they are very irrational; yet, when viewed in another way, they show a certain method.

"If we take, for instance:—

9 carats = 9-24ths = 9/24	
12 " = 12-24ths = 12/24	
15 " = 15-24ths = 15/24	
18 " = 9-12ths = 9 oz. gold in 12 oz. or 1 lb. troy.	
20 " = 10-12ths = 10 " " "	
22 " = 11-12ths = 11 " " "	

"In the first instance we have 3, 4, and 5-eighths, for the lower standards.

"In the second instance we have 9, 10, and 11 ounces of gold in the pound troy.

"These calculations are, however, old-fashioned and complicated. I may be permitted to remark here that, amongst other things, our weights and measures require also a thorough revision. A pound troy, for instance, is less than a pound avoirdupois, but an ounce troy is more than an ounce avoirdupois, for the one pound has 12 ounces, whereas the other is divided into 16.

"To return to the gold standards, I will remark that 22-carat is only used for the coin of the realm and for wedding rings. 18-carat is the most suitable for working. And 12-carat ought to be the lowest, as the metal would then be half-and-half, and has as much right to be termed gold as brass.

"I pass over the marking of silver, as I shall have no time to enter upon that subject this evening. It is, besides, of minor importance.

"We have now superficially glanced at the theory of Hall-marking, we will pass to see how it works in practice.

"I must really, at reaching this point, pay a tribute of justice to Mr. Edwin W. Streeter, of New Bond-street, who, indignant at the discredit that was being brought on the jewellery trade, called together, on the 6th of April, 1873, a select number of friends and the members of the press, and exhibited a number of articles bearing the mark of the Hall. The articles were picked specimens of ingenious swindling. The subject was readily taken up by the press, and very able writers have done their best to excite public attention and call special notice to the growing evil. Mr. Streeter, for thus stepping prominently forward as the champion of honest jewellery, deserves the greatest credit, and I am sure the public of London will show a due appreciation of his exertions.

"I will now read to you extracts from a few of the leading papers, written under the impression of what had been seen in Conduit-street on the afore-mentioned 6th of April. These extracts chime in so remarkably with the subject of my paper, that I have decided to embody them. There is, besides, much valuable moralizing; and coming, as they do, from able writers of the press, and corroborating all my statements, I have considered it very advisable to quote them:—

"On Saturday evening, a considerable number of gentlemen connected with the jewellery trade, including the President of the Pawnbrokers' Association, attended the conference at the establishment of Mr. Streeter, Bond-street, for the purpose of inspecting a large quantity of spurious Hall-marked jewellery, with a view to proving that the process of Hall-marking, adopted by the Goldsmiths' Company, is no protection to the public, in the purchase of what they are led to believe to be a guarantee that the articles so purchased are genuine. A large collection of articles was produced and examined, but the selection of two or three will suffice

to illustrate the fact that the public are subjected to the most astounding frauds, even with respect to that which is looked upon as jewellery of first-class character, and for which the highest price is paid. A lady's elastic neckchain, bearing the hall-mark as 18-carat gold, the value of which, if genuine, would be 11*l.*, was found to consist mainly of silver and red lead. A pawnbroker had lent 6*l.* 10*s.* upon it, and when assayed its intrinsic value was found to be 22*s.*

"A chain on which a pawnbroker was induced to lend 7*l.*, was found to be worth 36*s.*

"Another chain, every link of which is stamped as 18-carat gold, and on which 10*l.* had been lent, was found, on being assayed, to be but 11½ carat."

"This article was reprinted in the *Times*."

"The *Daily Courier*, of Liverpool, April 8th, 1873, says—

"The process of Hall-marking adopted by the Goldsmiths' Company is no protection to the public, in the purchase of what they are led to believe to be a guarantee that the article so purchased is genuine. A large collection of articles were produced at Mr. Streeter's, in London, and examined, to illustrate the fact that the public are subjected to the most astounding frauds, even with respect to that which is looked upon as jewellery of a first-class character, and for which the highest price is paid. An advertisement from an East-end jeweller was produced, offering to supply Hall-marked gold rings to the public at 5*s.* each and upwards, and a ring, with his invoice, was produced, which, although bearing the Hall-mark, was found to be filled with cement.

"A brooch, the outer casing of which was thin gold, and Hall-marked, was filled with copper exactly fitting the mould of the brooch. These frauds, it is contended, are committed by working jewellers, to whom the West-end firms entrust their gold to be manufactured, and it is argued that, so long as the Goldsmiths' Company consent to Hall-mark unfinished and hollow jewellery, there is no check. In France and America the Hall-marking is done by Government, and they refuse to affix the mark until the article is completed. If that system were adopted, and every shopkeeper compelled to guarantee the quality of the gold he sells, the public would be protected."

"The following is from the *Standard*, April 7, 1873:—

"The question of the Hall-marking of jewellery is one of the greatest importance to the public. The amount spent yearly in gold and silver articles is immense, and there are few who do not, at some period of their life, expend money in watches or jewellery for themselves or others. The belief in so doing they are buying articles of an intrinsic value, approaching at least to the sum paid for them, and that the goods will retain their value for a long period, and be thus a sort of investment for money, operates in a large number of cases as an inducement to people to spend more money upon jewellery than they could otherwise afford to do. Good jewellery indeed is always within a small amount worth the money given for it, and should approach nearly to its weight in sterling gold. In the days of our forefathers this was so. No gold was allowed to be sold under sterling, a severity which afterwards relaxed to 18-carat gold being permitted. With 18-carat gold people at least knew that they were getting goods containing three-fourths of their weight in gold. Now, however, the Halls mark 15, 12, and 9 carat, while articles are exposed in the windows of the jewellers' shops called gold, but containing only one-twentieth part of the precious metal."

"This is a very important fact, and I wish to bring it out most emphatically. Whether this immoral system of cheating should be permitted may be a question, but it is one in which I do not purpose entering. The more urgent question of Hall-marking is now before us.

"People who really wish to buy good articles always ask if they are Hall-marked. To them the unintelligible hieroglyphics convey no more distinct idea than if they were arrowheaded characters."

"On the important question of so-called 'duffing'* jewellery, I can only venture a few remarks in passing; it is a wide field, too extensive for me to-night. It embraces not only the metal, but also the stones. It consists chiefly of goods thickly gilt, containing an alloy which is anything but precious metal, and with a forged Hall-mark.

"A few words more from the *Standard*, and I have done with my quotations.

"The articles exhibited at Bond-street were all genuine Hall-marked articles, articles which a careful purchaser, armed with a treatise on Hall-marks a powerful magnifying-glass, would have bought fearlessly, and would have taken home under a profound conviction that he had received full value for his money."

"The present system of marking any pieces of unmade-up jewellery, and of hollow pieces evidently intended to be filled up with

* "Duffing," a slang word for cheating.

base metal, is offering a premium to dishonesty. In fact, as it stands at present, the Hall-marking does more harm than good. For if there were no Hall-marking the purchaser would only go to tradesmen of known respectability, and take his guarantee as to the quality of the gold, whereas at present he is careless, relying on the Hall-mark. It may be said that the Halls prosecute in cases of forgery. That they have the power to do so is undoubted; but when we consider the fact that we are inundated with worthless jewellery, and that we scarcely ever hear of a prosecution, it is evident that, in the first place, they are so wealthy that they do not care about the trouble of prosecuting; and that, in the second place, they do not desire it to be made public how little purchasers can rely upon the hieroglyphics known as Hall-marks. Even the members of the Goldsmiths' Company, the ultimate arbiters in such matters, confess that they are powerless in many cases. It is not very long since they issued a regulation not to mark chains, except of a specified weight and character, in consequence—to use their own words—'of having discovered that extensive frauds were being committed' in the matter of gold chains, which, if the present practice of marking were continued, they could see no means of preventing.

"Here we have it, on their own showing. Any one looking at the daily police reports, cannot fail to notice the frequent cases of base coinage. The solicitor to the Treasury would attest to the extreme difficulty of keeping even the coin of the realm unsullied.

"The anomaly of the law on the subject of Hall-marking will be readily understood from a decision given by Commissioner Kerr, in the case of *Defries v. Dalton* and others, heard in the City of London Court. The plaintiff had purchased some goods Hall-marked 15-carat, which, on testing, were found to be 9-carat. The Commissioner decided that the plaintiff could not recover against the defendant, but could recover against the Goldsmiths' Company, who had put on the goods stamps defining weight and value which were wrong. Such a judgment offers no relief. No one in the trade would bring an action against that corporation. It would be fighting against tremendous odds. There is another case where the law, and consequent justice in England, is too weak for the rich, too dear for the poor.

"We find, on the one hand, too much importance attached to the Hall-mark, and on the other a great prevailing ignorance as to its real meaning. What with date letters, municipal marks, lions rampant, and lions passant, makers' marks, and duty marks, there are about 250 cabalistic signs, unintelligible to the British public.

"It has long been my idea that the time has arrived to do away with the action of the Goldsmiths' Company altogether. The Goldsmiths' Company is an obsolete institution, one of those remnants of the dark ages incompetent to cope with the present state of things. The impotency of the Company to meet the evil is apparent by the number of charters which have been found necessary to be granted to it ever since the year 1392. The first charter to the Company was in the reign of Richard II., 1392, bearing date 6th of February, and we may consider that this corporation here first steps forward on to the stage. It grants and gives license to the men of the said craft of goldsmiths of the City of London, to be a perpetual community or society of themselves, and elect yearly out of themselves four wardens, to oversee, rule, and duly govern the said craft and community. This is the beginning of the Right Worshipful Company of Goldsmiths of the City of London.

"In 1462, Edward IV., another charter was granted. In 1504, Henry VII., a further charter was found necessary.

"But the natural tendency to mix too much alloy seems ever to have been very great, for as far back as 1238 frauds are recorded as having been practised by gold and silver smiths, and it became necessary to introduce some legislation to prevent this practice.

"The great mischief, however, as far as we are concerned, begins with the passing of the Bill allowing articles of the three lower standards to be stamped—reign of Queen Victoria, 1854. Here the reins seem to have dropped from the hands of the Goldsmiths' Company altogether, and it has lost all control over the millions of articles flooded into the market. Forgeries, transpositions, additions, loading, filling, and all the clever swindling that clever craftsmen can devise, have been adopted with impunity.

"Then, again, the charters of the Goldsmiths' Company make no provision for the frauds now being practised in our colonies. Of course all has changed, and the old body cannot march with the times. Watch-cases are sent from Switzerland and America with forged English Hall-marks, and are sold in India, China, Australia, Japan, and the rest of the world. What control can the Goldsmiths' Company possibly have in these cases?

"Nothing short of a clearly-defined and a clearly-expressed personal guarantee of a jeweller of established reputation will meet the evil.

The Company can no longer control the immensity of the jewellery trade, and a new Act of Parliament is absolutely indispensable, relieving this body of its duties, and taking the supervision into its own hands. This duty will devolve naturally on the Mint. The revenue which Government derives from the assay offices, for duty on gold and silver stamped, might be also greatly increased, and levied in a simpler manner; and the public would be satisfied as to the quality of the goods they buy.

"I have consulted many friends as to the possible modifications in the present system, and all agree with me that the time has come for the old edifice to be pulled down, and for a more modern structure to take its place. No half measures will meet the evil. Never mind the vested interests of a wealthy corporation. The battle will be fierce, but the victory will be to public opinion.

"Jewellery, as I have already said, is a vanity and a luxury, and is purchased only by people who have money to spare. A tax upon jewellery, therefore, would be felt by no one. This is necessary, in order to replace the small revenue to Government I have already mentioned. An intending purchaser, who has made up his mind to spend, say, about 100*l.*, will just as readily spend 110*l.* as 100*l.* for a jewel. It seems, therefore, very rational to tax such a pure luxury, instead of burthening the very necessities of life. And, were this scheme to succeed, as I think it must, what a pleasant satisfaction it would afford to think than an impost upon what we have to spare can successfully compete with the crushing duties on the most needful for the sustenance and comfort of life of other nations. I sincerely hope this will be a hint to legislation. I shall endeavour to show also what the probable financial result would be of the introduction of such a new scheme.

"Inspectors of weights and measures go their rounds, Custom-house officers are on the constant look-out to protect the revenue, fussy analysts annoy well-meaning tradesmen, but it seems nobody's business to look after the adulteration of the precious metals. There is no established legal definition of the word 'gold;' nobody to prosecute forgeries. The Goldsmiths' Company is too busy, and shrinks from being brought prominently forward, for a thorough investigation of the present state of things would hasten that inevitable fate which cannot be far off.

"I will quote an example of the indifference with which this corporation treats complaints respecting forgeries. The Secretary of the Liverpool Pawnbrokers' Association, Mr. Alfred Hardaker, had once occasion to present himself to the Goldsmiths' Company with a gold chain bearing a forged 18-carat mark. The metal only assayed 11½ carats. A promise was given then that the matter should be investigated, but, after some delay, it was decided to let the matter drop, on the ground that the marks were not forgeries of their Hall.

"On the 4th of February, 1856, it was ordered by the House of Commons that a Select Committee be appointed to inquire into the offices for assaying silver and gold wares in the United Kingdom. The members nominated for the Committee were:—Messrs. Wilson, Liddell, Stanley, Hankey, George Alex. Hamilton, Spooner, Brand, Wilkinson, William Ewart, Bentinck, Peacocke, Muntz, Dunlop, and Masterman.

"Persons, papers, and records were sent for from the assay towns of the United Kingdom, and the following report, after a good deal of discussion, agreed to:—

"REPORT.

"The Select Committee appointed to inquire into the offices for assaying gold and silver wares in the United Kingdom, have considered the matters to them referred, and have agreed to the following report:—

"1. Your Committee have examined a large number of witnesses from the principal assay towns throughout the United Kingdom.

"2. The existing assay offices are ten in number, and are established at the following places, setting them down in order according to the amount of assaying performed at each office:—London, Birmingham, Sheffield, Exeter, Chester, Glasgow, Dublin, Edinburgh, Newcastle-on-Tyne, York.

"3. The state of these offices, as to management and efficiency, differs widely. Your Committee find that those offices, in which a larger amount of assaying is performed, are conducted in a satisfactory manner; while the smaller offices are, generally speaking, in an inefficient condition, and do not afford proper security to the public for the accuracy of their work,

"[There is an admission at once, after a careful investigation, that they do not afford proper security to the public.]

"4. Your Committee are of opinion that the inferior condition of the smaller offices may be accounted for by their imperfect constitution, and by the absence of effective regulations, existing in the larger offices, for the testing the accuracy of assays—[and the public is expected to place faith in the Hall-mark in the face of this admission]—and partly by the more limited income which the smaller offices derive from assaying, and the consequent want of funds to place them in a superior condition.

"5. In the progress of their inquiry it has been made manifest that the laws regulating the assaying of gold and silver are in a most confused and unsatisfactory state."

"[I shall not be accused, I hope, of libelling the Company, and my object, partly, in reading to you this rather dry report, is to protect myself. The proofs of the correctness of my assertions are numerous enough.]

"These laws are scattered throughout a multitude of statutes, some of which are of very ancient date. Almost every assay office is established and regulated by statutes or charters exclusively applicable to itself. Thus the assay offices at London, Birmingham, Sheffield, Chester, Edinburgh, Glasgow, and Dublin, are regulated by separate statutes, differing more or less widely in their provisions.

"6. Your Committee are of opinion that the practice of assaying is calculated to afford protection to the public against fraud, and ought to be maintained, and they regard it also as a convenient mode of collecting the revenue.

"7. Your Committee strongly recommend that the several statutes by which the assay offices are now governed should be repealed, with a view to removing the anomalies and confusion of the existing law, by consolidating into one statute all the provisions requisite for the establishment and regulation of assay offices throughout the United Kingdom, whereby their constitution may be placed upon a sound footing, and full security afforded to the public for the correctness of assays in all offices without exception.

"[From this it is apparent that the Committee were not satisfied as to the correctness of the assays.]

"8. Your Committee further recommend that, among other provisions of such a statute, power be given to open new offices at any place in the United Kingdom, where it can be shown, to the satisfaction of the Treasury, that the manufacture of gold and silver wares requires such establishment for the convenience of trade, and where the income derived therefrom would be sufficient to defray the expenses; and to close any office where the amount of work is insufficient to support it, or where the work is inefficiently performed.

"9. Your Committee do not apprehend any serious difficulty in framing a comprehensive measure, by which all assay offices shall be placed upon a uniform and well-regulated system, applicable alike to England, Scotland, and Ireland."

"May 1, 1856.

"THE REMEDY.

"I have laid before you, to the best of my abilities, the system of Hall-marking at present in operation, and have pointed out its many shortcomings. I will now venture to suggest a new scheme, which is to supplant the action of the obsolete and badly-regulated Goldsmiths' Company.

"In framing the new scheme I shall have to bear in mind not only the protection of the public, but also the revenue to the Government.

"Before even attempting to grapple with the evil, we must begin by—

"1. Complete abolition of the action and interference of the Goldsmiths' Company. The grievances against this Company, shortly summed up, are:—Nonfulfilment of duty; inability to devise a simple, practicable and rational method of control over the ever-increasing manufacture of jewellery; and a drowsiness of action as regards all innovations required by the altered state of things. I will add, that in the face of the present progress, the Goldsmiths' Company stands like an old dilapidated house in the midst of modern, handsome buildings.

"2. The adoption of only three standards, 12 carats (articles to melt down to 11 carats), 18 carats (articles to melt down to 17 carats), 22 carats (articles to melt down to 21 carats).

"I would here remark that 12-carat ought to be the lowest that should bear the name of gold. A legal definition of the word might here be inserted, namely, any article which is not all through alike, and does not melt down to 11 carats, is not to be termed gold.

"3. Government inspectors to be appointed, with power to buy at fixed prices any article in any stage of manufacture, at any time, from the jeweller's workshop, for the purpose of having them assayed. (The Factory Act now in force gives this power in other instances.)

"The manufacturer would have to send a batch of goods to be inspected and examined, the inspector reserving unto himself the right of breaking up the whole, should one piece be found defective as to quality.

"What a risk an attempt at fraud would here involve! The touchstone might be used by the assayer, as in France; but this is a purely technical question.

"A new Act of Parliament should be passed, which might be called 'The Gold Adulteration Act.'

"All articles that are plated should be marked plated.

"No doubtful, unintelligible, cabalistic signs, imitating as closely as is safe the real Hall-mark, would then be practicable. The simple word 'plated' would say all, its absence would be misdemeanour.

"4. Every jeweller to give a written guarantee or invoice; and all jewels to bear the jeweller's or manufacturer's mark for identification.

"5. Every jeweller or dealer in jewellery to have a licence, forfeitable in case of misdemeanour.

"6. An *ad valorem* duty to be imposed on all jewellery manufactured, and charged on the gross proceeds of every jeweller's yearly sales, value of gem jewellery included.

"We will now enter upon a rough calculation as to how much a duty of 10 per cent. would produce every year to the Treasury. It is a rough and approximate calculation merely, and nearer guess-work than anything else; but the difficulty is in this instance no greater than in the first estimate of the probable yield of the income-tax.

"I estimate the number of first-class jewellers in the United Kingdom at 2400 (there would be as many more small ones), each selling yearly, on an average, to the value of 5000*l.* (gross value.)

"This would give 12,000,000*l.* for money expended every year by the British public on jewellery. Ten per cent. on this amount would yield 1,200,000*l.*, which, of course, the public would be charged with by the jeweller.

"Watches and gem jewellery are here included. There exists no good reason why watches should not pay duty.

"The jewellery from Germany and France should pay a proportionate duty.

"All wrought silver should pay an *ad valorem* duty, which, on 3,000,000 ounces yearly, would be at, say, 1*s.* per ounce, 150,000*l.*

"Goldbeaters' leaf, which is mostly imported, should also pay duty in the form of a stamp on every book.

"In short, I think that, with the existing machinery for collecting the revenue, such as income-tax collectors and others, with perhaps an additional slight expenditure, the trade in jewellery and gold might be taxed, to the detriment of really nobody, so as to yield a million and a half sterling every year to the Treasury."

After the paper had been read, the following discussion ensued:—

"The Chairman (Major-General F. C. Cotton, R.E., C.S.I.) said the demoralization arising from the present state of things was very great, and it was very evident that the present state of the law left the public open to any amount of deception.

"Mr. Edward J. Watherston, while thanking Mr. Lutschaunig for his able paper, and acknowledging his facts, came to very different conclusions. He was a member of the obsolete corporation to which reference had been made, and might make this remark with reference to it, that, considering the enormous increase of the population over which they now presided, it was no wonder that the Goldsmiths' Company did not now answer the purposes for which it was intended, when founded in the reign of Richard II. He felt certain the time was come when there ought to be no Hall-marks at all, when, in fact, they should be replaced by the reputation and character of the maker. It would never do to go back to the old-fashioned legislation now recommended, which had been completely overturned at the abolition of the corn laws, and could never be re-introduced. It was impossible in these days of free trade, when the commerce of the country had so enormously increased, to go back to a state of protection. His opinion was, that any one should make chains of 1-carat quality if he liked, though, of course, he preferred the high-class trade, with which he hoped his name would always be connected. People came to him, and to other first-class manufacturers, and never asked for any Hall-mark; they could not get Hall-marked lobsters, carpets, pianofortes, coats, or other articles, and he thought the trade of a goldsmith should be as free as that of a fishmonger or any other. He had heard the report of the committee, and felt sure that if the question was put before them now they would make no such foolish suggestions as that there should be any kind of espionage over the trade. In fact, with the present population it would be impossible; it would keep the whole of Scotland-yard going to look after the goldsmiths. If you wanted to buy good furniture you must go to a first-class shop, and if you did not you might get chairs which would not bear sitting on. He believed he spoke the sentiments of the trade, when he said that the Legislature ought to make it incumbent on every man to give a guarantee for what he sold, and then fine him by the criminal law if he cheated. If a man sold an article as 15-carat which was only 6, the county court or police court would be the proper place for him.

"Mr. Streeter asked how a jeweller could give a guarantee that an article was, say 15-carat gold, when, as often happened with lockets, the box was of copper. Some of the first houses used copper boxes

with gold lockets; and much of the so-called 15-carat gold would not assay more than 12.

"Mr. Watherston said he only stood up for free trade. Let every man make what he pleased, if he could find buyers.

"Mr. Webber said copper boxes did occur certainly, but he very seldom met with them. He did not think there was much value in Hall-marks in a good class trade; at any rate he had not found it so in twenty years' experience. If he stated that his goods were 16, 18, or 20 carats, it was accepted without a question, and there was an end of it. Practically he found the Hall-mark an encumbrance, especially when an article was wanted in a great hurry, because they took the best part of a working day to stamp and examine the article. He had been much interested by the figures given in the paper as to the proportion of gold in 15, 18, and 22-carat quality, and thought the numbers were simple and easily remembered. He chiefly differed from him as to the duty, which he thought would never be accepted. It was perhaps not generally known that at present the duty was only levied on wedding and mourning rings, though others might be Hall-marked. The time was gone by for levying a duty on one particular trade, and he could not find words to express his feeling of the iniquity of any such measure. The figures given, however, as to the amount of business done by jewellers were very much under-stated.

"Mr. White asked if he had rightly understood Mr. Lutschaunig to say that he heard of jewellery containing red lead?

"Mr. Lutschaunig said he had had to take to pieces at the Liverpool Assizes a lady's bracelet, composed of a very thin band of gold, under which was soldered a very thin band of silver; it thus formed a kind of tube, of the snake pattern, the interior of which was filled with red-lead paint. The value of the gold in the bracelet was about 16*s.*, whereas, if it had been what it professed to be, it would have been worth 9*l.* or 10*l.*

"Mr. White thought the man who made it deserved something for his ingenuity. He held that the public were very much to blame for their own want of enlightenment in this matter, and suggested that the simplest way of testing the quality of jewellery would be by taking the specific gravity. York, which was his native town, was no longer a place of assay, and it was not right that such small places should be; when he lived there, there were two jewellers, and one assayer, and he was so intelligent that he did not know prussiate of potash under the name of ferrocyanide of potassium. If he was a fair specimen of provincial assayers it was no wonder that jewellery of a doubtful character was produced. He must say he should not like such a system of espionage as was carried on in some places under the auspices of district analysts, whose powers in many cases led to great abuses.

"Mr. H. T. Wood wished to ask Mr. Lutschaunig what system of marking he proposed for adoption when the Goldsmiths' Company was abolished. The great fault in the present system was that it was exercised by a series of absolutely irresponsible bodies, for he believed only the Assay-office in Birmingham was in any way responsible for its actions, its assays being tested every year at the Royal Mint. He was not aware whether the same thing prevailed at Sheffield. It appeared to him that what the trade had to complain of was the present defective system of Hall-marking rather than the thing itself. There was a natural feeling in every tradesman that he was insulted if his wares were tested, and a mark put upon them; but that was quite a mistaken feeling. Those who understood the matter could take up a chain and ascertain its quality, but the public had no means of knowing, and it was not every one who had the opportunity and means of dealing only with first-class tradesmen. There was a great difference between jewellery and such things as coats and carpets, because of the intrinsic value. A person who bought a gold watch or chain looked upon it as a sort of investment, and expected to get nearly as much as he gave for it if he wanted to sell it, and therefore he required some kind of guarantee of its value. This the Hall-mark, as at present existing, did not seem to provide for; but a simple and proper system would. He should be glad, therefore, to hear any plan proposed which the public could easily understand, and which should take the place of the bewildering hieroglyphics now made use of.

"The Chairman proposed a vote of thanks to Mr. Lutschaunig, who had brought forward a most important subject, whether they agreed with him or not as to the remedy he proposed. He did not think it possible now-a-days to introduce a tax upon the goods sold in any man's shop, but it seemed quite reasonable to forbid any Hall-mark on gold below a certain standard. It also seemed pretty clear that the Goldsmiths' Company were no longer equal to the task imposed upon them, and that some further legislation on the subject was needed.

"Mr. Watherston felt sure the general feeling of the trade would

be that no gold below 18-carat should be marked. Twelve-carat gold was altogether an anomaly.

"The Chairman thought it would be well to abolish the carat system altogether, and speak of it as a per-centage.

"Mr. I. Chapman said he believed the lower qualities were allowed to be introduced in order to assist the country watchmakers at a time of great depression, when they were suffering considerably from foreign competition.

"The vote of thanks having been passed,

"Mr. Lintschaunig said gold and silver had never been classed with those articles which were within the province of free trade. Ever since the year 1200 they had been considered as equivalent to the coin of the realm, weight for weight, and free trade in such articles was impossible. There were many honest jewellers, but also many dishonest ones, and articles were palmed off for gold which were only partially made of that metal. This sort of lie was doubly dangerous, because it contained a particle of truth in it. The public were safe as long as they had to do with honest men, but they were exceedingly credulous, and required to be protected. It would not do to allow the market to be inundated with doubtful articles, for it was a dangerous principle to allow of any sophistication in articles so nearly allied to the coinage. The trade was free at present, and how did it work? Ever since the year 1200 the Government had been trying to prevent this adulteration of precious metals.

"Mr. Watherston said the era of protection was finished with the abolition of the corn laws, and he believed before long the duty on silver plate would be taken off, for the amount paid now was very little more than it was half a century ago, and the export trade was almost *nil*.

"Mr. Lintschaunig said his proposal was that every manufacturer should be compelled to produce all articles he manufactured, small or large, and deliver them to the inspector in bulk; the latter should then take one at random and assay it, and if it were defective in quality he should be authorized to break up the whole. The Hall-mark should be abolished, but the revenue to the Government must be replaced, and he could not see any objection to a tax on what was a pure luxury. The public would pay the duty, not the jeweller, though of course it would be levied on him in the first instance. If fifty millions worth of jewellery were sold annually, so much the better, it would produce a large revenue. Only silver was stamped at York, but he believed the charter was not withdrawn, as the name was mentioned in the House of Commons report. He did not propose any marks, but thought a law should be passed that all jewellery should be of a certain standard, that the definition of the word gold should be established, and that competent inspectors should be appointed with the power of visiting manufactories, which would be no more inquisitorial than cases under the Factory Acts.

"Mr. Streeter suggested in conclusion that the difficulty might be met by every jeweller being required to state the quality of the goods on the invoice."

[In quoting the above paper and discussion from the *Journal of the Society of Arts*, we do not necessarily identify ourselves with all the remarks therein contained, nor in any manner allude to the working of the Goldsmith's Company, but merely give the substance of the paper as it was read, and the discussion which ensued. *Ed. W. J. & S.*]

ASSAYING AND TELEGRAPHY.—The Patent Plumbago Crucible Company, of Battersea Works, London, have recently received a considerable order for furnaces, muffles, assay crucibles, etc., from the University of Michigan, Ann Arbor, United States. We understand the company will make a good display of their manufactures at the "Centennial" at Philadelphia, to which city they not long since supplied a quantity of their porous cells to Professor Barker.

EDIE'S GOLD, SILVERSMITHS', AND JEWELLERS' CALCULATOR, which shows at sight the exact value of gold, silver, and diamonds, at any given price, has already reached its tenth edition, and the usefulness of its contents is fully evinced by the demand which exists for the work. Dealers in gold and silver, who are constantly in the habit of dealing in minute divisions and subdivisions of a particular weight, are peculiarly in want of an assistant similar to that which this work presents. Without it, their only plan is to adopt a lengthy and intricate calculation (on the spur of the moment), which is tedious and uncertain, and often devolves on persons not competent to it, resulting in loss of both time and property. With such an aid the calculator is always safe; he can refer to what he wants without delay, and with perfect confidence in the result. The present edition has been prepared, with great care and accuracy, by Messrs. Turner & Co., St. John's-square, E.C., is sold at the low price of six shillings, and should be in the hands of every goldsmith, silversmith, jeweller, and diamond merchant.

CORRESPONDENCE.

"THE QUEEN'S NECKLACE."

To the Editor of the "WATCHMAKER, JEWELLER, AND SILVERSMITH."

Woodside Lodge, Church Road,
Upper Norwood, March 18, 1876.

DEAR SIR,—In the very interesting account of the "Queen's Necklace," which you have concluded in the number of your instructive journal for the present month, the singular escape of Madame Lamotte is not mentioned.

I enclose you an extract from Madame de Barrera, on "Gems and Jewels," published 1860, now a very scarce book, which you may think of sufficient value to print. Yours respectfully,

H. L. NELTHROPP.

"The wretched woman who had raised this tempest was sentenced to be flogged, branded on both shoulders, and imprisoned for life. When the former part of the sentence was executed she poured forth a torrent of foul abuse of the Queen; and, though she was immediately gagged, enough was heard and reported to form the ground of the vilest calumnies. Her husband, who had escaped to England, was condemned by default. He retaliated by the threat of the publication of a pamphlet, in which the Queen and the Minister, Baron de Breteuil, were strangely compromised, if his wife were not set free. Such a threat, from such a quarter, would seem deserving only of contempt. Strange to say, however, Madame Lamotte was not only permitted to escape to England ten months after, but the Duchess of Polignac was sent across the channel to purchase the silence of the infamous pair with a large sum of money. It is very probable that the conduct of the Baron de Breteuil, the implacable enemy of the Prince-cardinal, was not of a nature to be revealed to the world, but that the Queen, who could have nothing to fear from such a source, should have allowed herself to take a step so liable to misconception, proved very unfortunate. The bribe, too, was thrown away, for though one copy of the diatribe was burnt, a second was published some time after. A singular circumstance connected with this slanderous 'Memoir of Madame Lamotte' is, that the copies, now extant in the Imperial Library of Paris, were found in the Palace of Versailles when it was taken possession of by the Republican Government."

SUIT CONCERNING AN ALLOY FOR GOLD.

BIRMINGHAM COUNTY COURT.

Before Mr. H. COLE, Q.C., Judge.—John Moore Kemp, gold-plater, sued Henry John Cox, electro-plater, for a return of 50*l.* paid under a memorandum of agreement for the sale of a certain discovery in the manufacture of gold, the consideration of which agreement, it was alleged, had failed.

In August, 1874, defendant went to the plaintiff and represented that he had discovered an alloy for the manufacture of gold, and offered to sell the secret for 300*l.* He submitted a stone ring as a sample of the invention, and this resisted the action of nitric acid. The plaintiff ultimately agreed to pay 150*l.* for the secret. An agreement was drawn up, in which the defendant and a gold-plater, named John Poppenberg, who was acting as agent for the defendant in the manufacture of the alloy, undertook to give the plaintiff all the information required. The plaintiff thereupon authorized his manager to sign the agreement on his behalf and pay a deposit of 50*l.* on account. A short time afterwards the plaintiff went to Poppenberg's place of business, and the latter took certain metals—consisting of gold, silver, copper, and platinum—and put them into a crucible and melted them. The ingredients were melted four times, and the plaintiff took one of the pieces that had been melted, and sent it to be rolled; and in the rolling it cracked, and proved utterly useless.

Defendant stated that the secret was first brought under his notice by John Poppenberg, who received the whole of the 50*l.* He was not aware that the piece of metal manufactured from the alloy would not admit of being rolled.

John Poppenberg said he was present at the time of the secret being shown to Mr. Kemp. He had previously been getting 10*l.* a week out of the secret. He had been expending a lot of money, and was in embarrassed circumstances. Mr. Cox, the defendant, had been doing him a good turn at the time, and he then said to him, "We will go shares in this matter." Witness filed his petition some time after selling the secret. His creditors received a dividend of 1*s.* in the pound.

His Honour said the question for the jury to decide was whether the secret which had been shown to the plaintiff was capable of producing the articles of the kind and qualities mentioned in the agreement.

The jury, after a short consultation, decided that the defendant had failed to perform his agreement.

His Honour then gave a verdict for the amount claimed.

EXTENSIVE AND DARING ROBBERY OF JEWELLERY TO THE AMOUNT OF £20,000.

ONE of the most daring and systematic robberies which has been committed for several years past was perpetrated between two o'clock on Saturday afternoon, the 25th ult., and one p.m. the following day, during which time (but most probably on the afternoon of the first named day) the establishment of Messrs. J. R. Williams & Son, diamond merchants and manufacturing jewellers, of 108 Hatton-garden, was entered, and jewellery and diamonds to the above-named amount stolen.

Up to the present time no clue has been found to trace the perpetrators of this bold and extensive robbery. One or two theories have presented themselves and are being closely followed up by the police, but as it would be indiscreet and prejudicial to the strenuous endeavours which are being exerted to give publicity to any details, we refrain from so doing. As the window shutters of the establishment are left open every night, and a gaslight enables the police and passers-by to see the interior of the office where the iron safes containing the valuables are kept, it is reasonable to suppose that the robbery was committed before dusk on Saturday, when any one seen in the office from the outside, might have been taken for one of the persons connected with the establishment, and thus have disarmed suspicion. Mr. Williams is a man of great caution and foresight, and the care which he has for years exercised to guard against robbery, renders it the more surprising as well as doubly painful to all his friends, that such wholesale theft should (up to the present time) have been so successfully committed. Before leaving his warehouse, he personally inspected the fastenings and safes every evening, and although it has been his regular custom to visit the establishment every Sunday to see if everything was secure, he always made such visit without taking the keys of the safes with him, so careful was he to guard against any attack which might have been planned or attempted on such occasions.

When he visited the premises on Sunday, the 26th ult., about 1 o'clock, he unlocked the street door as usual, without finding the least indication of anything wrong. Passing through the warehouse door, which was still secured by one of Chubb's locks, Mr. Williams saw everything in perfect order, the safes being closed and the floor clear of any litter or sign of intrusion. Looking towards one of the front windows, however, he was startled by perceiving a number of jewel-cases on the counter, hidden from an external view of the warehouse by an opaque glass screen. Finding the cases to be mostly empty, Mr. Williams tried the safes, which were all locked. One of the cases, containing a number of watches, had been rifled, and only two or three of the most valuable taken, showing that the thief knew what was best worth securing. Mr. Williams was obliged to return home for the keys of the safes, and when he got back again to the house of business he was able to open them as easily as if they had not been tampered with. In fact, it then became perfectly evident that not only these receptacles of costly property, but the front door and door of the counting-house, had been opened with false keys made from moulds which must have been taken from the true ones.

The following is a list and description of the property stolen, for the recovery of which and apprehension of the thieves, a reward of 600*l.* has been offered, or in proportion to the amount recovered.

"1 wheatear and cornflower spray for the hair, about 16 ct. diamonds; 1 smaller do., 5 ct. diamonds; 1 wild rose and two leaves, forming pendant, 10 ct. diamonds; 1 do. earrings to match, 8 ct. diamonds; 1 pair of pearl and diamond border eartops, centre pearls 58 grains, brilliants 7 carats; 1 pair very fine centre pearls, 65 grains, set round with very fine brilliants and with single diamond tops, value complete 400*l.*; 1 pearl pendant, centre pearl 36 grains, and drop pearl about 30 grains, brilliants about 11 carats; 1 large yellow diamond, 18 carats, forming snap for necklace; 1 brilliant cable pattern links, forming chain of diamonds, 370 stones, 18½ carats; 1 fancy brilliant cross, 5 ct. diamonds; earrings to match, 3½ ct. diamonds; 1 pair cluster flower earrings, value 80*l.*; 3 diamond ornaments, mounted on velvet as necklet and forming brooch, and 1 pair of earrings, 100*l.*; 200 carats of loose *melée* brilliants, with these an old English drop brilliant about 6 grains; 1 brilliant key brooch, about 3 carat brilliants; 4 gold lockets, two with diamond stars, one with diamond band and button holes, one enamelled holbein band ornament (with large off-coloured brilliant centre), each locket about 60*l.*; 1 pair brilliant eartops, slightly off colour, 6½ cts.; 1 do., 2 carats each stone, very fine; 1 do., 1½ carat the pair; 1 brilliant pendant, the centre forming a cross with diamond loop, 150*l.*; 1 pearl and diamond star centre locket, with pearl and enamel border, and large pearl tie loop, set in gold; 1 pair enamel earrings to match, 50*l.*; 1 pair diamond three-drop earrings, silver set, 70*l.*; 1 do., silver set, with five drops, 60*l.*; 1 do. pink pearl earrings, with small diamonds, four drops, 24*l.*; 1 natural rose leaves and stem, all formed in brilliants, 300*l.*; 1 pair of brilliant comet star earrings, star tops, 67*l.*; 1 smaller do., 50*l.*; 1 large brilliant and rose diamond cross, entwined border, 100*l.*; 1 pair falling star

earrings, with wire between, 60*l.*; 1 pair earrings, centre rubies, 10 grains each, set round with turban of rose diamonds, 60*l.*; 1 pair very long diamond lace pattern earrings, 6½ carats of diamonds, 100*l.*; 1 diamond pendant, silver set, also forming centre of bracelet, gold taper band, diamonds on shoulders, 105*l.*; 1 gold strap bracelet, with brilliant buckle and strap piece, enamelled, 60*l.*; 1 pair large top and drop rose diamond earrings, in cut down silver settings, 50*l.*; 20 brilliant silver-set 5-stone half-hoops, between 30*l.* and 60*l.* each, rose diamonds between; 15 gold skeleton set diamonds, half-hoops, value 12*l.* to 25*l.*; 1 ruby and pearl bracelet, band 1½ inch wide 20*l.*; 1 wide bracelet, row of pearls in centre, two rows of rose diamonds, and two bars of purple enamel 1½ in. wide, 60*l.*; 1 gold band bracelet, 1½ in. wide, with coral and pearl button hole centre, value 20*l.*; 1 pearl and ruby centre bracelet, 1½ in. wide, 17*l.*; 1 locket centre bracelet, pearl star, taper band, pearls on shoulders, 18*l.*; 4 or 5 Roman corded filigree bracelets, about 1 in. wide; 1 large Roman mosaic swan-centre gold filigree chain necklace, earrings to match, 30*l.*; 1 interlaced shoulder small cameo and rose diamond centre; 1 very fine emerald centre and two brilliant three-stone ring, 150*l.*; 1 very fine one ruby and two brilliant three-stone ring, centre ruby 2 carats, 60*l.*; 10 very fine opal half-hoop rings, value 15*l.* to 52*l.*; 1 ruby half-hoop, rose between, 60*l.*; 2 brilliant band rings, claw settings, each brilliant 6 grs., fine quality, each 33*l.*; 1 brilliant cluster ring, seven brilliants on head, two on shoulders, silver cut down settings, 42*l.*; 1 brilliant single-stone trumpeted belcher ring, 3 carats, 70*l.*; 1 split shank 10 grain brilliant, 42*l.*; 1 fine round opal, set round with ten brilliants, 23*l.*; 1 dark oriental ruby, 6 grs., set round with eight small fine brilliants, 55*l.*; 1 crystal monogram 'A.E.I.' locket 3*l.*; 1 green enamel coral set locket, rose diamond in centre, 5*l.*; 31 plain gold oval lockets, thirteen from 2*l.* to 5*l.*, eighteen 1*l.* to 3*l.*; 5 round engraved open back lockets, 13*s.* to 26*s.*; 2 engraved ball lockets, 17*s.* and 19*s.*; 7 flat sardonyx lockets, 12*s.* each; 2 crystal Prince of Wales feather gold-mounted lockets, 30*s.* each; 1 silver locket with pencil, 30*s.*

"Bracelets—1 half hoop centre, with seven corals and rose diamonds between, 27*l.*, 1 in. wide band; 1 with diamond band centre, with two button holes, 60*l.*, 1 in. wide; 1 with three bars of turquoise, 16*l.*; 1 set of narrow bangles, one onyx, one coral, one pearl, value of set 17*l.*; 1 narrow holbein enamelled, set with five brilliants, 16*l.*; 4 or 5 sets of Roman gold and mosaic pendants and earrings, value each about 15*l.*; 1 cameo, set in Roman filigree; 1 Roman filigree vase pendant and earrings, enamelled centres about 20*l.*

"Seals, keys, and charms—11 red cornelian revolving seals, 1*l.* 4*s.* to 1*l.* 11*s.*; 1 blood stone and cornelian seal key, 2*l.* 8*s.*; 1 sardonyx bird seal, 1*l.* 17*s.* 6*d.*; 1 amethyst seal, 1*l.* 5*s.*; 1 coloured knot watch key; 17 compasses, 8*s.* to 1*l.* 3*s.*; 2 coral shell mortar charms, 1*l.* 15*s.* each; 1 18-carat rabbit charm, 2*l.* 15*s.*; 1 coloured lanthorne seal key, 4*l.*; 6 18-carat blood stone seals, 2*l.* 15*s.* to 4*l.* 8*s.* each; 1 crystal compass, corded border, 2*l.* 10*s.*; 3 18-carat hall marked, 2*l.* 12*s.* to 3*l.* 3*s.*, the letter 'B' and some other letter will form the initial hall mark; 5 18-carat seals, 1*l.* 15*s.* to 3*l.* 3*s.*; 1 18-carat Aneroid barometer charm, 4*l.* 15*s.*; 4 coloured gold seals, 1*l.* 5*s.* to 2*l.* 2*s.*; 5 small gold seals, 10*s.* 6*d.* each; 15 coloured gold bolt rings, 6*s.* 6*d.* to 10*s.* 6*d.*; 10 coloured gold bolt swivels, 9*s.*; 2 crystal compasses, coloured gold mount, 2*l.* 2*s.*; 5 18-carat gold swivels, 11*s.* 6*d.*

"Pins—9 square onyx cameo, plain Roman settings; 12 oval do., do.; 12 oval shell cameo, in fancy gold settings; 1 cameo, set round with six small brilliants; 1 eight-head enamelled, 'Bell'; 1 thread head square onyx cameo, Roman set; 3 enamel dogs' head, terrier bulldog, and mastiff; 6 enamel head, Garibaldi, Shakspeare, &c.; 1 crystal, cat in basket, 5*l.*; 1 do., racehorse and jockey, 5*l.*; 2 do., bulldog and terrier, each about 4*l.*; 1 carbuncle shell, pearl centre; 2 oval plain carbuncle, undercut; 24 horse shoe, various, gold and platinum, some modelled rough; 1 fancy pearl enamelled cap, pearl forming head, ruby eyes and diamond tongue; 1 diamond star disc, 1 ruby do.; 36 cheap coloured gold, assorted values, ranging from 10*s.* to 1*l.* 10*s.*; 1 single pearl.

"Albert chains—1 18-carat curb, open curbs, fetter and knot, fetter and three rings, twisted fetter, twisted end fetter and knot, fetter and three rings, fetter and ring; 1 bright fancy open curb; 1 bright fancy fetter and ring; 1 9-carat heavy close curb, about 3 oz.; 1 9-carat fetter ring and knot, about 2 oz.; 1 9-carat flat fetter and ring.

"Necklet chains—5 flexible, various widths, from 3*l.* to 10*l.*; 2 Brazilian large size, 5*l.* to 6*l.*; 4 smaller do., 1*l.* 10*s.* to 2*l.* 10*s.*; 12 fancy pattern 1*l.* 10*s.* to 3*l.*

"French chains, 18-carat—1 ruby-mounted ornament lady's albert, about 15*l.*; 6 do., 8*l.* to 13*l.*; 2 ruby-mounted guard chains, 10*l.*

"Brooch chains—8 guards, various patterns, fancy fetter, &c., 5*l.* to 12*l.*; 6 brooch, various patterns, 3*l.* to 8*l.*

"Lockets—2 square, mounted with padlocks in platinum; 1 gold match-box; 1 George and Dragon, plain gold; 6 enamel, monogram 'A.E.I.'; 1 gold, with pearl star, 13*l.*; 1 gold, lozenge-shape; 13 gold engraved, from 1*l.* 10*s.* to 3*l.*; 28 do., from 10*s.* to 2*l.*; 3 square portemonnaie, each 1*l.* 10*s.*; 1 stirrup, 2*l.* 4*s.*; 1 small onyx, 2*l.* 6*s.*; 1 ruby and pearl wreath, 1*l.* 10*s.*; 1 lion's head locket seal, 2*l.* 10*s.*; 1 cameo signet ring, engraved shoulders, 4*l.* 10*s.*; 1 sard intaglio signet do., Byron, 3*l.*

"Gold watches—One No. 37754, 14 size, jewelled 6 holes, compensation balance, value 10*l.* 10*s.*; one 37761, 16 size, 6 holes, gold balance, 10*l.* 10*s.*; one 37768, 16 size, 6 holes, 11*l.*; one 37287, 16 size, 8 holes, both compensation balance, 11*l.* 5*s.*; one 37615, 12 size, 2 holes, crystal glass, 4*l.* 10*s.*; one 37494, 14 size, 6 holes, O.F., 10*l.*; one 37893, 16 size, 6 holes, compensation, O.F., 11*l.*; one 4107, 16 size, 6 holes, ¾-plate, plain case, 13*l.*; one 3922, 10 size, 10 holes, ¾-plate, hunter dome, 16*l.* 16*s.*; one 37971, 10 size

2 holes, gold dial, O.F., 8 $\frac{1}{2}$; one 37958, 14 size, 6 holes, compensation balance, O.F., 10 $\frac{1}{2}$ 10s.; one 4064, 4 size, 4 holes, $\frac{3}{4}$ -plate, gold dial, engraved, O.F., 10 $\frac{1}{2}$ 10s.; one 4233, 12 size, 6 holes, gold balance, crystal glass, 12 $\frac{1}{2}$; one 39035, 16 size, 6 holes, gold balance, O.F., 10 $\frac{1}{2}$ 10s.; one 4416, 14 size, $\frac{3}{4}$ -plate, 8 holes, compensation balance, O.F., 13 $\frac{1}{2}$ 13s.; one 4229, 10 size, 6 holes, $\frac{3}{4}$ -plate, gold balance, hunter, 13 $\frac{1}{2}$ 13s.; one 38361, 14 size, 6 holes, compensation balance, O.F., 10 $\frac{1}{2}$ 15s.; one 38362, 14 size, 6 holes, compensation balance, O.F., 10 $\frac{1}{2}$ 15s.; one 38036, 16 size, 6 holes, gold balance, O.F., 10 $\frac{1}{2}$ 10s.; one 38261, 16 size, 6 holes, compensation balance, O.F., 11 $\frac{1}{2}$; one 18792, 16 size, 8 holes, compensation balance, O.F., 11 $\frac{1}{2}$ 15s.; one 4237, 12 size, 6 holes, $\frac{3}{4}$ -plate, gold balance, O.F., 11 $\frac{1}{2}$; one 4412, 16 size, 8 holes, $\frac{3}{4}$ -plate, compensation balance, O.F., 13 $\frac{1}{2}$ 13s.; one 4240, 14 size, 6 holes, gold balance, xtal., 13 $\frac{1}{2}$; one 4433, 12 size, 6 holes, gold balance, hunter, 14 $\frac{1}{2}$ 10s.; one 4200, gold hunter, 18 $\frac{1}{2}$; one 4500, gold hunter, 17 $\frac{1}{2}$. One silver, No. 37755, 14 size, 2 holes, steel balance, 4 $\frac{1}{2}$ 10s.

The keys must have been made with great skill from moulds secured at some moment when Mr. Williams may have laid his keys down while in his office, and here we cannot refrain from uttering a word of caution to those having valuables under lock and key, "NEVER PLACE YOUR KEYS DOWN FOR A SINGLE MOMENT" which may present sufficient opportunity for an impression, but always, whether safes are locked or open, keep the keys concealed. We fervently hope that the active and pursuing measures which are being followed up by the police will bring the perpetrators of this bold robbery to justice, and lead to the restoration of the property. Dealers and the trade in general should lend every aid in their power by keeping a sharp look-out in case of any of the property being offered to them.

WATCHMAKING.

THE GOING-BARREL PRINCIPLE.

A CORRESPONDENT of the *English Mechanic* writes as follows in that journal of the 24th ult.:—

"I quite agree with your correspondent, 'Naturalized,' that the principle adopted by the Waltham Company—the going barrel—is the best one for the production of a good, sound, cheap watch, and I am satisfied that it could be applied with success in this country. At the same time I may observe that it would be by no means such an easy matter as some persons, unacquainted with the watch trade of England, might think it to be.

"It is quite true, as your correspondent observes, that prejudice runs high in the trade against the adoption of the principle in this country, and so highly conservative are the workmen—of course I do not refer to their politics (so also are the factors, or merchants, and the retailers)—that I am satisfied that if a manufacturer determined to adopt the principle he would have to produce most of the materials himself, and, following the example of our volatile Prime Minister, 'educate a party' of workmen up to the question.

"Now this, it is perfectly clear, would require that a man should be possessed of not only an extensive knowledge of the trade, but a considerable capital, and, as your correspondent intimates, plenty of English pluck. I am afraid few manufacturers could be found possessing all these requisites; but, given these conditions, I firmly believe that a thorough good time-keeper, in a strong hall-marked case, could be produced at a price that would place it within the reach of thousands of the people who are now unable to procure a sound, reliable watch.

"It will, perhaps, be a source of satisfaction to 'Naturalized' to learn that I am informed, on good authority, that a manufacturer of some eminence in England has already erected a large factory, in the Midlands, where he is engaged in the production of a watch of a somewhat similar character to the Waltham—of a quality and at a price that, unless I am very much deceived, will cause a revolution in the watch trade of England.

"W. H. B."

THE WATCH AND CLOCK MAKERS' HANDBOOK.

MR. F. J. BRITTEN, the well-known editor of the *Horological Journal*, and also the teacher of the Art classes of the Institute, has compiled the above valuable shilling's worth for the benefit of the trade. It contains "simple rules for calculating Conversions, Lever Trains, Motion work, Fusees, lengths of Pendulums, Clock Trains, &c., &c." Tables of the different rules are given, together with examples sufficiently plain and brief; and, also, ample directions for making zinc and steel compensating pendulums. It is a very useful consuler to have handy on the bench—no waste of words in it.

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Adjudications of Bankruptcy.

The first date is the date of the Adjudication, the second is the date of the first General Meeting of the Creditors.

BENJAMIN FREDERICK P. and HUGO WARNER, trading as PHILLIPS & WARNER, Northampton-street, Birmingham, jewellers' factors and stone-dealers.

SENIOR ALLEN, Grove-street, Huddersfield, dealer in watches and jewellery. Mar. 16. At C.C. Huddersfield. April 6 at 11. Jones, jun., Reg.

Liquidations by Arrangement or Composition.

The first date is the date of the Petition, the second is the date of the Meeting of the Creditors.

ABRAHAMS VICTOR, 107 Cleethorpe-road, Great Grimsby, jeweller. Feb. 26. F. Summers, solicitor, Hull.

APPLETREE ISADORE, Wills-street, Aston, near Birmingham, jeweller. Mar. 2. Edwin Parry's, solicitor, 30 Bennett's-hill, Birmingham.

CLARK RICHARD PHILIP CHARLES, Colston-street, Bristol, jeweller. Mar. 2. Benson & Thomas, solicitors, Broad-street, Bristol.

COHEN ISRAEL, Soho-hill, Birmingham, jewellers' factor. Mar. 7. Charles B. Hodgson, solicitor, Waterloo-street, Birmingham.

FAIRLEY JOHN, Craven-street, Chapel-fields, Coventry, watch manufacturer. Mar. 4. O. Minster, solicitor, Coventry.

FISHER GEORGE, Westgate-road, Newcastle, jeweller. Mar. 13.

GOLDBERG ALEXANDER, Aberdeen-street, Chorlton, Manchester, jeweller.

LEON HERNTZ, Claverton-street, Bath, jeweller. Mar. 18. At 27 Colmore-row, Birmingham. April 5 at 2.

RUBINSTEIN BERNARD, Vittoria-street, Birmingham, jeweller. Feb. 29. A. H. Foster's, solicitor, 13 Bennett's-hill, Birmingham.

SAMUEL LOUIS, Stocks-street, Cheetham, Manchester, jeweller. Mar. 13.

Dividends.

The Dividends are payable at the offices of the respective Assignees or Trustees named at the end of each notice. Bkt., Ins., Liq., or Asg., following the name, indicates whether the dividend is under a Bankruptcy, Insolvency, Liquidation, or Assignment.

LASHMORE JOHN (Liq.), Southampton, watchmaker. 1st and final div. 4s. 4d.; J. J. Burnett, 2 High-street, Southampton.

MORRIS AARON (Bkt.), Sunderland, jeweller. 1st and final div. 2s. 3d.; H. Rawlings, John-street, Sunderland.

Dissolutions of Partnership.

ALFRED FAULKNER and WILLIAM ILES FAIRELL, Ryde, Isle of Wight, jewellers.

ANGELL & BROWNE, 10 Strand, goldsmiths and jewellers. Jan. 3.

BROWN & DODDS, Riddle's-court, Lawnmarket, Edinburgh, silver platers, &c. Feb. 29. Debts by Robert Brown.

BULLER, HUTCHINSON, & Co., Bartlett's-buildings, jewellers and merchants. Jan. 1. As regards Thomas H. Tapley.

COLLINGWOOD & Son, 46 Conduit-street, Hanover-square, jewellers.

TEBBITT & Son, Foster-lane, wholesale jewellers.

WOLF & PASSMORE, Bradford, jewellers and silversmiths. Jan. 1. Debts by Harry Passmore.

Bankruptcy Annulled.

BUNKES WILLIAM. Jan. 27. Langley Moor, Durham, watchmaker. Mar. 13.

Meeting.

GENESE SAMUEL (Bkt.), Daulby-street, Liverpool, jeweller. At C.C. Liverpool, April 7 at 11, exam.

Last Days for Lodging Claims.

STUART JOHN (Bkt.), Liverpool and Coventry, watch manufacturer. (The notice of declaration of div., which has been paid, was not gazetted.) Claims by April 5 to Thomas Gibson, 47 North John-street, Liverpool, or will in default be excluded from the benefit of the div.

Meetings of Creditors under Sequestrations.

SERVICE JOHN, Newton-Stewart, Wigtown, watchmaker, &c. W. D. Quick's 75 Bath-street, Glasgow, April 6 at 1. Consider acceleration of div.

ASSAYING.

GOLD IN ANCIENT TIMES.

[ASSAY; French, *Essayer*; Italian, *Assaggiare*; Spanish, *Ensayer*.
To prove; to take or make proof; to make trial.]

SUCH are the forms and meanings of the word assay in one of our great dictionaries; we will, however, proceed to a more extensive application of the term, both in scientific and practical senses, confining ourselves exclusively, or nearly so, to silver and gold. In by-gone times the term was used indifferently as *assay*, *essay*, and *say*; the proof or trial of the goodness, purity, and value of metals and metalline substances. In ancient statutes such proving was called *The Touch*, and those who were officially connected with it were called *The Keepers of the Touch*; whilst in the seventeenth century the "Wardens of the Touch" are mentioned as the declared persons who had charge of the marking punches at Goldsmith's Hall. We will refer more especially to this part of the subject hereafter.

Assaying in some form or another must have existed far beyond the period known as that "whereunto the memory of man runneth not," for we find it mentioned in a great volume that is pretty well known to all our readers. Mr. Lutschauing in his "Book of Hall Marks," in the opening chapter of the subject upon gold and silver, says: "At the mention of these metals, associated as they are with the grand and magnificent, with all that is costly and rich, with all that tells of rank, and fortune, and greatness, we feel but little inclined to believe in the meaner uses to which they are made to adapt themselves, and wherein their beautiful physical properties, which have gained for them such high renown, are comparatively lost." After enumerating the very extensive use of gold in the decorative arts, the writer concludes his introduction thus: "Beloved and coveted by all grades of society, from the king and the lord to the pauper, gold is the great lever of our actions—the 'open-sesame,' the key to every door; it is the adorning of every virtue, and the beautifier of our every feature; it is the symbol of wealth and power, the boast of kings, the pride of nations; all men bow to it; all things that are of man can be purchased with it; and—be it said with sorrow—it is too often the great goal of our earthly ambition—its possession the aim of our endeavours." With which expressions most people cordially agree.

"And 'tis gold

Which makes the true man kill'd and saves the thief;
Nay sometimes hangs both thief and true man: as what
Can it not do and undo?" CYMBELINE.

"Look you, I love you well; I'll give you gold,
Rid me these villains from your companies;
Hang them, or stab them, drown them in a draught,
Confound them by some course, and come to me,
I'll give you gold enough."

"Hence! pack; there's gold, ye come for gold, ye slaves."

"He pours it out; Plutus, the god of gold,
Is but his steward."
Thou ever young, fresh, loved, and delicate wooer,
Whose blush doth thaw the consecrated snow
That lies on Dian's lap; thou visible god
That soldier'st close impossibilities,
And mak'st them kiss; that speak'st with every tongue
To every purpose! O thou touch of hearts!
Think, thy slave man rebels; and by thy virtue
Set them into confounding odds, that heasts
May have the world in empire." TIMON OF ATHENS.

"How quickly nature falls into revolt

When gold becomes her object!
For this the foolish, over-careful fathers
Have broke their sleep with thoughts, their brains with care,
Their bones with industry;
For this they have engrossed and piled up
The cankered heaps of strange achieved gold." HEN. IV., p. 1.

"The gorgeous east with richest hand
Showered on her kings barbaric pearls and gold."

At what period when mankind began to love gold—too often inordinately—there is no history to tell; even the scant records of the most ancient nations of the world bear testimony to that love. Allowing that to be so, it is only reasonable to assume that there must have been some method of assaying it that has not come down to our own time.

To go, however, as far over the waters of history as we can, we will refer to some passages in the well-known book previously alluded to. We find in the second chapter of Genesis that "a river went out of Eden to water the garden, and from thence it parted, and became into four heads. The name of the first is Pishon; that is it which compasseth the whole land of Chavilah, where there is gold; and the gold of that land is good." Now, that passage, which is said to have been written nearly 4000 years ago (as commonly accepted), and from the expression that the gold of that land was good, it clearly points to some existent method of establishing that fact. Good gold implies bad gold, consequently, there must have been some mode of ascertaining that fact.

In Exodus, chap. xxv., we have directions for the making of the tabernacle, and the ark is directed to be overlaid with pure gold, within and without, as well as a crown of gold "round about." There are also to be a number of gold rings, and the mercy-seat is to be of pure gold, having on the ends two cherubims of beaten gold. Again, the table was to be overlaid with pure gold, whilst the dishes, spoons, covers, and bowls were all to be made of pure gold. Many other articles were also to be made of the precious metal and "beaten work of pure gold." Now we desire to specially call attention to that extra instruction, that the gold shall be pure gold. Let any one examine the text for themselves (in the original *Zaav Tahour*) and, we apprehend, they will have little difficulty in arriving at the conclusion that there was some well-planned mode of obtaining this purity that such particular instructions were given about.

In the first book of Kings, chap. x., we read that the Queen of Sheba gave King Solomon a hundred and twenty talents of gold, as the tribute of her admiration for his wisdom. He made two hundred targets and three hundred shields of beaten gold; his great ivory throne was overlaid with gold; all his drinking vessels were of pure gold, whilst the navy of Hiram was engaged in bringing gold from Ophir. Here, again, the word "pure" plainly tells of some way that they had in making it pure, and knowing when it was so. Not content with all this gold King Solomon "made silver to be in Jerusalem as stones." Ophir must have been the great gold-producing country of the Biblical world, for Job counsels that it should be laid up as stones. In Chronicles we read of David giving instructions to Solomon about the building of the temple, in the fittings and furniture of which gold plays a very important part; next to it, silver. And here comes a singular passage from Job. "Surely," he says, "there is a vein for the silver, and a place for the gold where they fine it." The word "fine" in the sentence at once directs our attention to the fact that they had an assay. We are told of Abraham, that "he was rich in cattle, and in silver and gold." If we may be allowed to draw deductions from kindred sources, we might almost infer that the ancient world was not without a certain amount of chemical knowledge in such matters. Indeed, of this there is little doubt, for it is more than probable that the Israelites during their sojourn in Egypt learned a great deal in such branch from the Egyptians, who were supposed to be better versed therein, and that they probably turned such knowledge to good account in manufacturing the articles for the Tabernacle, and no doubt the possession of that knowledge was an unfortunate aid in the turning out of the "golden calf." To return to our subject, however, we have read that on a mummy that was unrolled about five-and-twenty years ago, an inscription was found upon the linen written in indelible ink. Upon being analyzed this ink was found to have been dissolved in—what does the reader think?—Nitric acid! Now, if the ancient Egyptians had the knowledge appertaining to nitric acid, it is very likely that their chemistry would include a knowledge also of muriatic acid, the liberation of salts, and the articles necessary for dissolving the golden calf that Moses destroyed by grinding to powder.

If we follow up our investigation through the pages of the Bible we shall find gold and silver mentioned in more than 300 places; and, what is very pertinent to our purpose, the term "refined" frequently occurs. Almost everything that was required for carrying on the worship of the Temple of Solomon, from crowns to candlesticks and snuffers, was made of gold. What do we find in the first book of Chronicles, already quoted? "He gave of gold by weight for things of gold, for all instruments of all manner of service; silver also for all instruments of silver by weight, for all instruments for every kind of service. Even the weight for the candlesticks of gold, and for the lamps thereof." And so on through a long list of cherubims, chains, rings, tables, flesh hooks, spoons, wedges, carriages, shields, tongs, hinges, basins, candlesticks, snuffers, censers, steps, footstools, &c., &c.

The Chinese, too, from the records of their immemorial history, were well acquainted with the character of gold, and always dealt

with it as a substance whose value surpassed every other metal and commodity, with the exception of precious stones. "John Chinaman" is as fond of gold as anybody else. In fact, the Australian miners say that when "John" quits a claim every one else may as well pack up and go with him.

There must have been an enormous quantity of gold in the ancient world, and the question naturally arises, what has become of it all? Semiramis, the celebrated Queen of Assyria, ornamented her capital of Babylon with statues of pure beaten gold. Two of them, those of Jupiter and Rhea, were each forty feet high, and weighing a thousand talents. We have all heard of Darius, King of Persia, through the writings of Herodotus, surnamed the "Father of History." So plentiful was gold with that monarch that his officers had not time to "coin" it for the king's service. It was run in a molten condition into earthen pots; when it cooled, the pots were broken, and pieces of gold were chipped off from time to time and weighed out as wanted. Again, there was Cræsus, King of Lydia, whose name to be "as rich as Cræsus," has founded a proverb; as applying to a man who is known to be "warm," or who has "made his pile," as they say in America. Well, Cræsus had an army of 460,000 foot, and 60,000 horse soldiers. He made a gift to the Temple of Delphi—his church—of no less a sum than 3,000,000*l.* of our money. In the time of Ptolemy Philadelphus, the Egyptian public treasury held gold to the value of 178,000,000*l.* The Roman Emperor Augustus had more than 32,000,000*l.* bestowed upon him by the legacies of friends; whilst Tiberius left nearly 23,000,000*l.* in gold at the time of his death. Vespasian, on his accession to power, called for the enormous sum of 322,916,000*l.*, as the estimate wherewith to carry on the service of the country. Our dear old friend Marc Anthony, too, whom we all know so well through his soul-stirring oration over the dead body of Cæsar in the play, managed to afterwards squander 5,500,000*l.* of the public money.

Whilst we are speaking of the Romans we must not omit to mention that they had an assay, the *Obrussa*, or trial of gold; *aurum, obryzum, or exactum*, signifying the purest gold. There were also *argentum, pustulatum*, the finest silver; or *purum putum; argentum infectum*, bullion, unwrought, or uncoined silver; *factum*, plate; that is, made, or wrought silver; *signatum*, coined silver; *nummus asper*, new-coined; *betus or fritus*, old, &c.

What the common people had in the way of money it is impossible to ascertain; but their masters were very well off indeed. Apicius, the model man of ancient dinner-givers, spent nearly 500,000*l.* on luxurious living. When his fortune came down to about 81,000*l.*, he became so fearful of dying of starvation on what he termed so small a sum, that he finished his miserable life by poison. Pliny says, that one Lollia Paulina had a full-dress jewel worth 322,291*l.* Julius Cæsar presented the mother of Brutus with a pearl that was valued at close upon 50,000*l.*; whilst the one that Cleopatra is said to have swallowed during supper with Anthony was worth 80,729*l.* Our old acquaintance Æsop, the fable-writer, who lived at the Court of King Cræsus, put on the table at a small dinner-party of friends, a dish that cost him 807*l.* Caligula, too, is reported to have spent on a single supper the almost incredulous sum of 80,700*l.* odd. Lucullus, another of the princely lights of those sumptuous times, is stated to have given for suppers in the hall of Apollo, a regular sum of 1614*l.* One of their "town houses in Rome cost 352,786*l.*, and another 119,479*l.* Cicero, who is so much admired for his splendid orations, gave over 800*l.* for a table that was made of citron. To crown all, what is known in classic history as the *aurea domus*, or Golden House of Nero, must have cost an immense sum; Otho laid out in completing only a portion of it, no less than 403,645*l.* Even a fish-pond was sold for 32,291*l.*, and the fish of Lucullus fetched the same sum. Romans were inordinately fond of fish.

These incidents are mentioned here to show, not only how plentiful gold was among the Roman nobility, but also to indicate how it was disposed of, although we are not in possession of their method of assaying. Notwithstanding all this, their love of gold was as great as ours is in the present day. For instance, their great satirist, Horace, thus gives his mocking advice to the citizens. We will give the verses in the original, and supply a translation that shall be sufficiently near for all practical purposes:—

*"Vilius argentum est auro, virtutibus arum,
Ocives, cives, querenda pecuniam primum est;
Virtus post nummos."*

"Silver is of less value than gold; gold than virtue. O citizens, citizens, seek wealth first; virtue, after money."

*"Isne tibi melius suadet, qui, rem facias; rem
Si possis recte; si non, quo eungho modo rem?"*

"Does he advise you best, who says, 'Make a fortune; a fortune, if you can, honestly; if not, a fortune by any means?'"

*"Ut quidam memoratur Athenis
Sordidus ac dines, populi contemne re vocas
Sic solitus: Populis me sibilat; at mihi plaudo
Ipse domi, simul ac nummos contemplor in area.
Tantalus a labris sitiens fugientia captat
Flumina. Quid rides? Mutato nomine, de te
Fabula narratur."*

"As a certain person is recorded to have lived at Athens, covetous and rich, who was wont to despise the talk of the public in this manner: 'The people hiss me abroad; but at home I applaud myself as soon as I contemplate my money in my chest. The thirsty Tantalus catches at the streams which elude his lips. Why do you laugh? The name changed, and the tale is told of you.'"

Passing from the Romans to the Greeks, we have only space for one of their methods, and that was the famous hydrostatic assay of King Hieron's crown by Archimedes, the celebrated philosopher, of Syracuse. In order that this mode of testing may be understood we shall have to go a little out of our way to explain the principles of it; but, first of all, we will give the story of the crown.

Archimedes was related to Hieron II., who ascended the throne of Syracuse when the former was quite a young man. This Hieron was the son of one Hierocles, a wealthy citizen and a very able man, as a prince and administrator, and he would be the first to recognize and appreciate the talents of his gifted kinsman; the latter was born about 212 years before the Christian era. Hieron had delivered to a goldsmith a certain weight of gold to be made into a votive crown. This having been done the crown was returned to the king *weighing the proper weight*, and so far there seemed to be nothing to complain. Somehow, or other, however, it occurred to his majesty that his golden gift was alloyed with silver; but to determine the fact without injuring the crown was the problem to be solved. As Archimedes was known to be "fathoms deep" in mathematical studies, the king, the crown, and the philosopher were soon in "solemn conclave," the result being that the verification of the matter was left in the hands of the master of theorems and demonstrations. His mind became possessed with the problem, and a key to the solution was not long in coming forth. Bathing was one of the great duties of every-day life among the nations of that period, and Archimedes went to bathe. The bath being full of water as he stepped into it, he was mentally struck by the very simple fact that a quantity of the water of the *same bulk as his body* must come out of the bath before he could be covered all over with the remainder of the fluid. Here was the secret unlocked "as by a stroke of the enchanter's wand." By a deductive reasoning process, quick and bright as the lightning's flash, he saw that by immersing a weight of pure gold equal to what should have been, or would be in the crown, if it were unalloyed, in a suitable vessel filled with water, and marking how much was displaced by the crown itself, he could find out whether it, or the pure gold were *the greatest in bulk*. We have it on the authority of Vitruvius that, "As soon as he had hit upon this method of detection, he did not wait a moment, but jumped joyfully out of the bath, and running naked to his own house, called out with a loud voice that he had found what he sought. For as he ran he called out in Greek, 'Eureka! Eureka!'" (I have found it, I have found it!) It is stated on the further authority of another historian—one of that time—that from the moment of the philosopher explaining his discovery to the king, Hieron declared that he could never refuse to believe anything that Archimedes told him.

The method that he pursued was something in this way. A lump of gold of the quality which had been given out for the crown, and of the same weight, was placed in a suitable vessel, and that vessel was then carefully filled with water, level with a given mark afterwards made. The assaying piece was then as carefully removed, allowing all the water that would drip to drip from it.

The line of flow in the water was next accurately noted, and the crown gently immersed. If the water rose to the line mentioned, and remained there, it was proof positive that the metal had not been tampered with, it was all right; if it had, the water-line would rise higher, and it would be bad for the goldsmith. History does not say which way the verdict went; but the principle of proof is founded upon the following "law" appertaining to hydrostatic truths.

"If two bodies have equal magnitudes, their absolute weights will be in the same proportion as their specific gravities." By way of demonstration we will take different substances:—A cubic foot of water under certain scientific conditions weighs 1000 oz. avoirdupois, and that standard is always taken for practical purposes as well. Now, it has been found by experiment that, reducing the quantity from 1000 oz. to 1000 grains we arrive at the following results. If the bulk of 1000 grains of water at a given temperature 40 degrees, be ascertained and weighed, then the same bulk of beaten gold, such as King Hieron's crown, would weigh 19,350 grains. Or, to put it another way; if the water is taken to mean 1, let it be ounce or pound, as the case may be, then the gold will be 19·35, hammered, and 19·25 times the same weight, if cast. We have stated that a cubic foot of water at the temperature of 60 degrees, Fahrenheit's thermometer, weighs very precisely 1000 oz. avoirdupois. From this it will follow that a cubic foot of gold will weigh 19,350 oz. and 19,250 according as it is hammered or cast; whilst silver will weigh only 10,470 oz. To come a little lower down in detail, we know that a cubic inch of water weighs 253·34 grains, or 0·528 oz. troy; cast gold 10·160 oz. troy; silver, 5·525 oz.; and copper, 4·602 oz. troy. A vessel that would be filled with 1000 grains of water, would hold 19,250 grains of cast gold, and 10,470 grains of silver. Thus it is that gold is 19½ times the weight of water, and silver 10½ times less than that weight. The solution of Archimedes can now be understood; namely, as a given weight of gold is only about one half the bulk of the same weight of silver; whilst the former would raise the water in the vessel to the height of the displacement of that bulk, the silver would require nearly as much room, and consequently, as the water would rise in accordance with the bulk immersed, we see at once that the great mathematician was right. If one-fourth of the gold that had been given out to make the crown had been taken away, and silver melted up in its place, that silver, as has been shown, requiring more room, even when melted and hammered, bulk for bulk, than the gold, would have shown, by the rise of the water-surface, that "something was wrong." Let any one try the experiment with a cubic inch of lead, and a cubic inch of marble. They will find that they will require about four times the size in marble to weigh that of the lead, whilst it will correspondingly act on the rising of the water; or if the cubic inch of marble be immersed, whilst it will raise the water to the same height as the lead, it will only weigh about one-fourth of the lead's weight. Thus we see another application of the value of mathematical science.

ASSAYING BY THE TOUCH.—The first that we read of this mode of assaying was in the reign of Henry I., but according to other writers, in that of Henry II. It appears that the Bishop of Salisbury of that day was the Royal Treasurer of the State; and, although he considered that the money paid into the King's Exchequer for his Crown rents was both *numero et pondere*—right in number and weight—it might, nevertheless, be mixed with copper or brass. Then came the "trial by combustion," not unlike the method of assaying silver—and the officer who made it was called the *Tusor*, whilst the trial itself was named *Essaium*. All the particulars will be found in the "Black Book of the Exchequer," by Gervase, of Tilbury. The touch-needles were formed of small pieces of gold, silver, and copper, both pure, and in graduated combinations of alloy, fixed upon beforehand. The stone used is one of the blackest that can be found, and was of very fine grain, the black, rough marbles, or soft black pebbles from the beds of no-tidal rivers being deemed the best for the purpose when well-smoothed. The way of using the touch was to rub the metal to be tried upon it, and then beside it rub on the touch-needle that, experience had shown, would produce the same colour on the stone as the metal had done, after the places had been wetted by the tongue. In 1667 a book, called the "Touchstone for Gold and Silver Wares," was published, which contained full directions upon the subject. In the seventeenth century there was a black marble called *Basanus Hibernicus*, or the "Irish Touch-stone," found in the county of Antrim, which had the reputation of the most superior quality for the purpose of testing the precious metals. For an off-hand immediate approximation to value the touch-stone is still used in most jeweller's shops where second-hand manufactured articles are brought in, either for sale, or, by known persons, to have the jeweller's opinion taken on their value. Mr. Latschannig has reduced even the touch-stone and needles to something like a system. For instance, he has changed them to the "Star and Touch-stone," the star having six gold points, of the respectively known qualities of 7, 9, 12, 15, 18, and 22 carats. He has, also, a touch-stone and set of "needles" for silver; the method of using both the gold and silver "ouches" are fully set out in his "Book of Hall Marks," to which allusion has already been made in this paper.

THE MODERN METHOD.

THE ASSAY BY CUPELLATION.

The art of assaying in its relation to gold and silver is to determine their state of purity, and the nature of the deteriorating mixtures, if any. When amalgamated with what is called "alloy," the amount of that amalgamation can be determined. It may be here mentioned that the term "alloy" is, according to lexicographers, derived from the French term *à la loi*, meaning "as the law allows," in relation to the admixtures of baser metals with gold and silver to form a legal standard. All these have to be determined by the skill and accuracy of the assayer, and the confidence voluntarily reposed in him is second to nothing known throughout the whole social or mercantile world. A bullion merchant, a mint, or a bank, chips an atom of an ingot and sends it to the assayer, and, upon his report, transactions of enormous amount take place, with the utmost reliance upon his statements.

We recently were granted permission to spend an afternoon in one of our leading assay offices, to witness all the processes, and the results of what we saw are briefly embodied in this paper.

Upon entering the office with our specimen, say, of gold, to be assayed, it is taken in, and has a number assigned to it, and is passed on to the "balance-room." This room is shut off by double doors, and every precaution taken to prevent noise and the admission of dust; all talking is strictly prohibited in here, whilst "no admittance," whether with business or without it, is at all tolerated. The visitor hears nothing, in fact, but the faintest buzz of the faintest whisper. You look round for the cause of this, and it is pointed out to you that there are desks along one side of the room, that each desk has a "weigher," and that those weighers are working with atoms of gold upon balances standing on the desks in glass cases of their own, which balances, are sensitive to the one-thousandth part of a grain. In good truth, you move through the place "with bated breath and whispering humbleness" after hearing that information. Our assay is next passed on to a gentleman called the "junior weigher," who dexterously clips a piece off it and places that piece in his balance. Having weighed it, it is then handed to the "senior weigher," who repeats the process. The next procedure is to place the assay so weighed on a board wrapped up in a certain quantity of pure, thin lead. What is the lead for? it may be asked. Well, it is for this. To form a carrier for the base metal contained in the assay, of which we will say more hereafter.

The assay having taken its place among others on the aforementioned board, is carried up to where the furnaces are. Here the register board awaits the whole of them, such board having eighty-eight "receptacles" for as many assays. The arrangement of these receptacles correspond with the eighty-eight cupels already made red hot in the muffle furnace. Whilst the assays are dropped into their cupels we will make some little inquiry about the latter. A cupel is made of moistened bone-dust, and its peculiar property in this direction lies in the fact that, whatever portion of the lead is not destroyed by sublimation the cupel absorbs, and with it the whole of the base metal. Each cupel will only stand one assay; it has done its work, is thrown on one side to be carted away, ground up, and purified for dust for new cupels. The cupels that we saw were about an inch in cube, with a small cavity in the centre to hold the assay. The register-board, also, is marked to agree with what follows. A workman, with a pair of long tongs, nimbly "snaps up" each assay and drops it in its assigned cupel on the furnace floor, which furnace is already nearly white hot. We have now the specimen in its place in the furnace agreeing with the place it had on the register-board. From all these circumstances we learn one important fact, namely, that from the moment the assay is numbered, that number and identity are never lost sight of until it returns to the balance-room, its quality written down, and made ready for delivery to the purchaser. It seems scarcely credible at a first thought, but, when you see it, and follow it all round, and note the faultless organization that prevails, the thing is plain enough.

The furnaces of an assayer are called muffle furnaces, the fire occupying a space outside of and round their sides. When the muffle is closed the following entries have to be made on suitably printed forms.

"Date. Muffle number. Time commenced. Time completed. Remarks." The furnaces are about 2 ft. 6 in. high. The square aperture which receives the muffle and fuel is about 12 in. by 15 in. Coke is generally used as fuel; but steam coal was being burnt in the furnaces under notice. The muffle is really the assaying furnace that is placed within the fuel-burning furnace, and takes its requisite heat from the latter; those muffles were

made of fire clay. To show the rapidity with which cupels can be made by means of a fly press, we were informed that 240 of them could be made in forty minutes.

When the assay has been a sufficient time in the furnace to solidify it is taken out and cooled. The next operation (bearing in mind that we are assaying gold) is to extract any silver that may exist in it, as the cupellation is not sufficient for that purpose. It is hammered, and rolled into a thin strip, and then softened by annealing before a blow-pipe. It is then rolled up and put into one of a series of ninety small cells of platinum, that are joined altogether in one frame. This frame is placed in a platinum pan of boiling dilute nitric acid, the specimen, on account of its thinness, being in the best condition for the acid to act upon the silver. The little cells are "slitted" on their sides, to enable the acid the more freely to work through them. The first bath is a comparatively weak solution of the acid; but, after it, the specimen is placed in a stronger one, in order to take out any portions of silver that may still remain. This having been effected, it is now purified in two boilings of distilled water to purify it from the acid solution; after which, it is annealed in the annealing furnace, taken out, cooled, and carried back to the balance-room. Here the same accurate weighing is repeated, the weight now to the 1000th part of a grain is ascertained, and, being compared with what it was before departing on its journey of purification, a balance is struck, and the difference duly recorded. It is now "signed, sealed, and delivered" to the customer. We wonder what particular mode of assaying was prevalent in Shakspeare's time when *Angelo*, the goldsmith, says, in the "Comedy of Errors:"—

"Saving your merry humour, here's the note
How much your chain weighs to the utmost carat;
The fineness of the gold, and changeful fashion."

The assay which has been described above, terminating with the separation of the silver from the gold, is termed the "gold parting assay," because it parts one metal in its strong affinity from the other; even other metals, including copper, when cupellation does not do it sufficiently. There is one great improvement in assaying to which we must call attention, and that is the difference between the new and old methods of extracting the silver after cupellation. We have already detailed the small cells of 90 in a frame by which the specimens, or cornets, as the technical name is, are held in the nitric acid bath. We will now mention the old way.

It was formerly called *quartation*, or *inquartation*, and was thus performed. The cornet, button, or specimen, as the reader may choose to call it, having been "flatted," and rolled, was placed in a kind of bottle called a "matrass," with about 3 oz. of water, nitric acid added from time to time, and heat applied by a sand bath. When all the silver was dissolved by the acid, cooling gradually took place, washing followed and annealing completed the process. Our 90 pieces according to that method would occupy two persons for three hours. By the plan that we saw in operation, one person can do the same amount of work in forty-five minutes! Now this difference is a matter of very simple arithmetic; thus: As two men's work is to three hours, what is the ratio existing between that, and one man's work for three-quarters of an hour? As there are four three-quarters of an hour to three hours, and as only one man is employed during that three-quarters of an hour, instead of two for three hours, it follows, "according to Cocker," that only one-eighth of the time is now taken up. But, besides this the bottles were likely to be broken, and the whole of the assay lost. Even now, however, the "matrass" method is sometimes used for assays where the gold product is likely to be in a broken form.

This report of every assay is duplicated in a book arranged for that purpose, so that the bank, or bullion merchant can refer to it years and years after it has been made. Each delivery paper is stamped with such dates and letters as will enable the firm to trace every one concerned in the assay as long as paper and book are in existence. The working of the system is so perfect that there seems nothing left to be desired. Assays received from the country in the morning are sent off with their report the same evening.

The assaying of silver proceeds much upon the same principle as that of gold with a few differences in the details; one thing being that the cupellation is made at a comparatively low temperature. The fused litharge having the power of moistening, as it were, the cupel, is quickly absorbed by the bone-dust as the assay proceeds. In the last position of the melting the button exhibits great agitation in the cupel, shows all the colours of the rainbow, and finally settles into the state called "brightening," "fulguration," or "coruscation." Litharge, it may be observed, is "stone-silver," fused protoxide of lead, from the Greek, *lithos*, a stone,

and *argyros*, silver; fulguration is from the Latin *fulgeo*, to flash, or shine, whilst coruscation is sparkling by shaking; throwing off sudden flashes of light. We need not, now, go more minutely into this part of the subject.

MESSRS. JOHNSON & SONS, assayers to the Bank of England, the Royal Mint, and bullion brokers, was the establishment where we were introduced to witness the processes that we have briefly attempted to describe. The firm was formerly in Basinghall-street, before they removed to where they are now, in Cross-street, Finsbury. The present building has been specially designed, fitted, and furnished, so far as money, ingenuity, and experience could design, fit up, and furnish a modern assay office. On entering from the street, the visitor ascends a flight of stone steps, moves along a passage, and reaches the receiving and delivery desk. This desk is glassed in from intrusion, and a glass partition bars the way in the other direction. At this desk, or desk-closet rather, everything is received, and given, and all inquiries are made. One part of the counter is occupied by telegraph instruments, whose wires are in connection with both the Brokers and Melters to the Bank of England; and if we judge by the bell-tinkling that went on whilst we were within hearing, those instruments have anything but a sinecure time of it. We may say, here, that the smallest quantity required for a silver assay is 1 dwt., and for a gold, or gold and silver assay, half a dwt., whilst for "sweep" the weight of half a pound is necessary. Steam mills for grinding "sweep" ores, residue, &c., are available when wanted. We will now take note of the arrangements around us.

The great objects to be achieved in the construction of the building were, to remove the assaying and balance-rooms as far as practicable from the action of the street vibration, dust, and noise. Upon looking around, as far as we could ascertain, those objects seem to have been effectively attained. After getting into the inner passage we reach the door of the Balance-room and—obtain admission. We have mentioned this room before, in connection with the weighing of the assay. We find ourselves in a lofty, well-warmed, well-lighted, and well-ventilated apartment. The roof is of saddle-back form, and through properly selected glass plates fixed in it the light is admitted without glare. The warming is effected by means of hot-water apparatus all round the walls, whilst the ventilation is said to be as perfect in its action as can be desired. In the Balance-room, as we have stated, no talking is permitted under any pretence whatever, the business being conducted in a whisper. The gentlemen who work at the balances never seem to walk; they flit about, what little movement they do use, as though they were holding converse with the governing genii of gold and silver whom no one can see but themselves!

The details of our visit having been previously described, it only remains for us to acknowledge our thanks to the Messrs. JOHNSON for the information they gave us, and the facilities so courteously placed at our disposal.

THE FORTHCOMING EXHIBITION OF SCIENTIFIC APPARATUS AT SOUTH KENSINGTON.

LAST week we paid a visit to the South Kensington Museum for the purpose of gathering some particulars relative to the forthcoming exhibition of scientific apparatus. We must tender our acknowledgments to Mr. Norman Lockyer, who has charge of that department, for the courtesy with which he received us, but we found that the various entries are in so disarranged a form that no particulars could be correctly obtained at the present moment. We understand, however, that the astronomical, horological, and electrical sections will be very full of interesting objects. Arrivals are coming from all the scientific centres of Europe, but, as usual in such instances, the senders are all delaying till the last moment and even after the announced time. We hope to be enabled to give full particulars in our next. At present all is confusion.

MESSRS. T. & J. BRAGG, of Birmingham, have just finished a rare specimen of art, in a BADGE and CHAIN manufactured by them for the Mayor of Swansea. The Chain of Office has been presented to the Corporation of Swansea by Mr. Frank Ash Yeo, whose year of office as Mayor of that borough expired in November last. The ornament is of massive Gothic design, and executed in that manner and style for which Messrs. Bragg have so wide and merited a reputation, reflecting considerable credit on all parties concerned in its design and manufacture.

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PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

839. JOHN GEORGE HENRY HOCH, of 283, Brixton Road, Brixton, in the county of Surrey, Watch and Clock Manufacturer, for an invention of "An improved system of public and other clocks."—Dated 29th February, 1876.
891. WILLIAM WHITTLE, of Smethwick, in the county of Stafford, Engineer, and JAMES NEWMAN, of Small Heath, near Birmingham, in the county of Warwick, Jeweller, for an invention of "Improvements in coating with metals light articles composed of metal, such as nails, screws, tacks, and other similar small wares, as well as the light parts of machines, as also in the machinery, apparatus or appliances for effecting the same."—Dated 2nd March, 1876.
927. JAMES COGGINS and GEORGE BAXTER, trading in co-partnership as Stampers and Piercers, of Birmingham, in the county of Warwick, and THOMAS WILLIAM GREAVES, Jeweller, of Birmingham, aforesaid, for an invention of "Improvements in single or compound telescopic crotchet crooks and handles, and which said invention is also applicable to tooth-picks, pipe probes, and other like articles."—Dated 4th March, 1876.
956. THOMAS WILLIAM GREAVES, Jeweller, of Birmingham, in the county of Warwick, for an invention of "Improvements in ornamenting solitaires and other articles of jewellery with pressed glass, and which said improvements are also applicable for other useful purposes."—Dated 6th March, 1876.
1051. ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, for an invention of "Improvements in compensation balances for marine and other chronometers."—A communication to him from abroad by Joseph Thadæus Winnerl, of Paris, France.—Dated 10th March, 1876.
1091. EDWIN POWLEY ALEXANDER, of 14, Southampton Buildings, in the county of Middlesex, Consulting Engineer and Patent Agent, for an invention of "Improvements in pocket alarums or alarm watches."—A communication to him from abroad by Charles Frédéric Dietz-Monnin, of the firm of Tapy Brothers & Company, of Paris, in the republic of France, Manufacturers.—Dated 13th March, 1876.
1149. NUGENT WELLS, of Newport, in the county of Monmouth, Optician, for an invention of "Improvements in mariner's compasses."—Dated 17th March, 1876.
1178. HIPPOLYTE COLLOT, of 55, Lamb's Conduit Street, in the county of Middlesex, Jeweller, for an invention of "Certain improvements in solitaires."—Dated 18th March, 1876.

Grants of Provisional Protection for Six Months.

400. To LIONEL COHEN SPIERS, of the firm of D. & L. Spiers, of Birmingham, in the county of Warwick, Manufacturing Jewellers, for the invention of "Improvements in rings, slides, or fastenings for scarfs, victorines, and other like articles of dress."
436. To GEORGE HAYTER CHUBB, of 57, St. Paul's Churchyard, in the city of London, for the invention of "Improvements in safes and strong rooms."
464. To THOMAS JAMES SMITH, of the firm of Robertson, Brooman, & Company, of 166, Fleet Street, in the city of London, Patent Agents, for the invention of "Improved means and apparatus for setting or regulating calendar watches."—A communication to him from abroad by Louis Joseph Crozet, of Rue des Halles, Paris, in the republic of France,

520. To GIUSEPPE ZAFFIRA, of Pentonville Road, in the county of Middlesex, Engineer, for the invention of "Improvements in watches, clocks, and chronometers."
697. To JOHN COMPTON WEEKS JEFFERYS, Manufacturing Jeweller, 14, Tottenham Court Road, in the county of Middlesex, for the invention of "An improved fastening for jewellery and articles of dress."
760. To WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for the invention of "An improved machine for cutting diamonds and other precious stones."—A communication to him from abroad by Henry D. Stover, of the city and state of New York, United States of America.
1091. To EDWIN POWLEY ALEXANDER, of 14, Southampton Buildings, in the county of Middlesex, Consulting Engineer and Patent Agent, for the invention of "Improvements in pocket alarums or alarm watches."—A communication to him from abroad by Charles Frédéric Dietz-Monnin, of the firm of Tapy Brothers & Company, of Paris, in the republic of France, Manufacturers.

Notices to Proceed.

520. GIUSEPPE ZAFFIRA, of Pentonville Road, in the county of Middlesex, Engineer, has given notice in respect of the invention of "Improvements in watches, clocks, and chronometers."
3991. DUNCAN MCGREGOR, of Glasgow, in the county of Lanark, North Britain, Chronometer Maker and Optician, has given notice in respect of the invention of "An improved instrument for directly verifying compass indications."
4130. WILLIAM FORD STANLEY, of Great Turnstile, Holborn, in the county of Middlesex, has given the like notice in respect of the invention of "Improved machines or clocks to register conditions of the atmosphere, and to keep correct time."

Patents which have become Void.

657. MORTIMER GEORGE COLE, of Belvedere House, Bexley Heath, in the county of Kent, for an invention of "Improvements in watches and other timepieces."—Dated 4th March, 1869.

Patents Granted in Foreign States.

BAVARIA.

108. A. SPANIER, of Frankenthal, for "A machine for the manufacture of watch-glasses."—2 years.—Dated 9th August, 1875.

UNITED STATES.

- No. 172,630. WILLIAM IMHAEUSER, of Brooklyn, N.Y., assignor to Elise Imhæuser, of the same place, for "Watchmen's time-detectors."—Application filed 7th January, 1876.—*Brief*.—"A marking device attached to the lid of the case, and vibrated both horizontally and vertically by the action of the key passed through the lid."
- No. 5442. ALBERT H. POTTER, of Chicago, Ill., U.S., for "Improvements on watches." (*Perfectionnements aux montres.*)—10 years.—Dated 1st December, 1875.

FRANCE.

- 108,632. JEFFERYS, for "Improvements in solitaires for sleeve links."—Dated 2nd July, 1875.
- 108,806. SOUTHWOOD, for "Improvements in calendars applicable to clocks and other chronometers."—Dated 12th July, 1875.
- 108,818. DALLOZ, for "A machine for cutting and polishing precious and other stones."—Dated 14th July, 1875.
- 108,905. SMITH, for "Improvements in the treatment and manufacture of metals and their alloys."—Dated 21st July, 1875.—(English Patent, 20th July, 1875.)
- 108,966. ROULINA, for "A machine for roughing diamonds."—Dated 24th July, 1875.
- 108,549. BERGER and NEITER, for "Applying concave mirrors to jewellery."—Dated 8th July, 1875.
- 109,041. BRION and BOUDET, of Paris, for "Applying cork sheets in the manufacture of microscopes employed by watchmakers and others."—Dated 30th July, 1875.
- 109,170. TROUVE, for "Electric almanacks or calendars."—Dated 10th August, 1875.
- 109,118. DEVIENNE, of Lille, for "A mechanism of electric clocks, applicable to all clocks or regulators."—Dated 18th August, 1875.
- 109,213. DETEURE, for "Obtaining metal objects imitating steel jewellery and gold articles by stamping."—Dated 14th August, 1875.
- 109,295. PLUBEAU and GUERAND, for "Improvements in the manufacture of click and spring-work for watch-keys."—Dated 19th August, 1875.
- 109,386. INGELBACH, for "A machine for engraving cameos on precious stones, onyx, agate, and other hard stones."—Dated 28th August, 1875.
- 107,030. FARCOT, for "A clock with an auxiliary remontoir."—Dated 19th August, 1875.

FINGER RINGS

(Continued from page 149).

THE episcopal ring, being thus necessarily a mark of rank, was worn about this time over the gloves; sometimes as a thumb ring, and often of very large sizes. The ornaments of the elergy

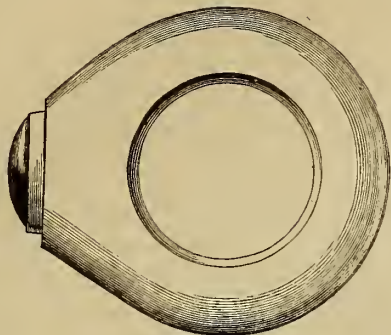


FIG. 50.

became more massive as the wealth of the Church increased. As the elergy were during church service separated from the laity, many of the latter were at a considerable distance from them. This may be a reason for the size adopted for episcopal rings. A late dean of St. Patrick's had in his collection a very large ring of this kind, represented in Fig. 50, from a sketch made by the author when it was in the possession of W. Huxtable, F.S.A., in 1847. It was of bronze thickly gilt, and set with crystal.

This peculiar form was generally adopted for rings at this period. The Londesborough collection furnishes us with a curious specimen (Fig. 51), formed of gilt copper and set with a small ruby, which must have stood forth from the finger in what would now be considered as a most inconvenient manner. Fig. 52 exhibits the form of the plain hooped ring, simply decorated with quatrefoils on each side of the stone (in this instance a small irregularly-shaped sap-



FIG. 51.



FIG. 52.

phire), which is embedded in a somewhat solid setting projecting from the ring.

In the *Gentleman's Magazine* for 1848 is engraved a massive ring, also of brass thickly gilt, the hoop chased with the arms of Pope Pius II. (the famed Aeneas Sylvius), and his name, *Papa Pio*, between the tiara and the cross keys. On each of the four sides of this ring appears one of the four beasts of the Revelation, typifying the Evangelists; they are executed in high relief. It is set with a large topaz. This ring has since passed into Mr. Waterton's fine collection, who is the fortunate possessor of others of the same class. One in the Londesborough collection is here engraved (Fig. 53), as a good specimen of the general design adopted for such rings.

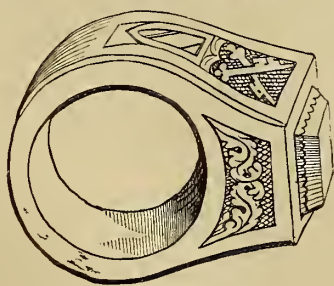


FIG. 53.

The crossed keys surmount a coat of arms on one side of the ring, the keys alone appear on the opposite side; foliated ornament fills the space above the circle on either side. This ring is set with a large crystal.

We close our series of episcopal rings with one found in the cathedral at Hereford during the repairs of the choir in 1843, which rendered the removal of the beautifully-carved alabaster monument

of Bishop Stanbery unavoidable. This bishop held the see from 1452 until his death in May, 1474. Upon opening the tomb a few fragments of bone were discovered, very small portions of the mere remains of the silk of the robes in which the body of the bishop was enveloped, and this beautiful ring, of which views are given in Figs. 54 and 55. It is of gold, set with a sapphire; the sides of the

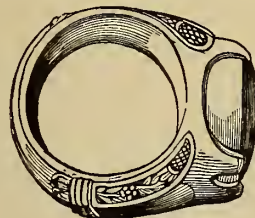


FIG. 54.



FIG. 55.

ring are decorated with sprays and flowers on a ground of dark enamel, and inside is the motto "*En bon an.*"

A very large ring, bearing great general resemblance to the episcopal ring, was occasionally worn as a thumb ring by the laity. A specimen of such a one is selected from the Londesborough collection in Fig. 56. It is somewhat roughly formed of mixed metal, and has upon the circular face a conventional representation of a monkey looking at himself in a hand mirror. This is surrounded by a cable moulding, and on each side is set two large stones. The outer edge of this ring is also decorated with a heavy cable moulding. Inside, next the finger, is the cross and sacred monogram, placed on each side of the mystic word *anamzapa*, which we shall



FIG. 56.



FIG. 57.

immediately have to explain more fully when speaking of the rings commonly worn as charms.

These massive thumb rings were indicative of wealth or importance when worn by the middle classes who had obtained any municipal position. When *Falstaff* speaks of his slenderness in his youth, he declares that he could then have "erept through an alderman's thumb ring." Like the massive gold chains still worn by the honourable fraternity, they told of a trader's wealth. The inventories of personal property belonging to the burgesses in the Middle Ages contain frequent allusions to such rings, without which they would have felt shorn of an important part of their hard-earned honours. Among the wills and inventories preserved at Bury St. Edmund's, published by the Camden Society, is one made by Edward Lee, of that town, bearing date 1535, in which he bequeaths to a friend "my double wreathed ring of gold whych I wear on my thumb." From this description it is evident that this ring must have borne great resemblance to that given in Fig. 56, with its outer cable or double-wreathed pattern. There is a brass in Hastings' Church, Sussex, with the effigy of a gowned citizen wearing such a ring. That such rings became in the end indicative of that class, and were retained in fashion for this reason when they had been long disordered from general use, may be safely inferred from the description of a character introduced in the Lord Mayor's Show in the year 1664, who is said to be "habited like a grave citizen—gold girdle and gloves hung thereon, rings on his fingers and a seal ring on his thumb." Such rings were evidently used, according to the most ancient mode, as personal signets by such as were not entitled to bear arms; hence originated the quaint invention known as "merchant's marks," which were impressed on merchandise, painted on shields instead of armorial bearings, inserted in memorial windows of stained glass, and worn on the thumb for constant use in sealing. A very fine ring of this kind is engraved in the *Journal of the Archaeological Institute*, Vol. III., and is here copied in Fig. 57. It was found in the bed of the Severn, near Upton, and is probably a work of the fifteenth century; it is of silver, and has been strongly gilt. The hoop is spirally grooved, and upon the circular face is a large letter H surrounded by branches.

(To be continued.)

MESSRS. GREENWOOD & SONS' NEW CLOCK ESTABLISHMENT.

WE may congratulate trade on the completion of one of the most magnificent edifices of its kind that has hitherto been erected in this country. Indeed, we are inclined to question whether any edifice so artistic, as grand, and capacious for its purpose, even on the continent of Europe, as the one under notice can be found. The building is situated in Farringdon-road, a little to the west of Clerkenwell-green. Its appearance is most palatially imposing, and when we consider that we are looking upon the first specially-designed building of its kind in England we feel an interest in it which would not arise in the ordinary way. The style is Gothic—that kind of Gothic that we may denominate the “severe early;” in fact, to the non-architectural observer, it looks like the transition link from the Anglo-Norman to the Gothic. We will describe it as viewed externally from the street.

We have, first, a half-sunk basement, then the ground floor, the windows of which are between Gothic columns, and headed with the semi-lancet arch, to display all the characteristics of the style. Above this is the first floor, and above the window heads is a broad fascia-band across the entire front, having, in Gothic letters, “JOHN GREENWOOD & SONS, IMPORTERS & MANUFACTURERS.” Higher up is another floor, and above that, again, a fourth, each window of which is columned and headed in keeping with those of the ground floor. In the space over each window-head are circular stone tablets, upon which are carved shields of arms, one being those of the City of London, another of the county of Middlesex, and on others the emblems of time and eternity. Above the parapet, the front takes a triangular form, terminating in a finial, or upright bouquet-looking form of stone-piece. In the centre of the triangle is a large illuminated clock, which will be sure to be appreciated in the neighbourhood, as it shows time there alone in its glory. In the upper part of the triangle, just below the finial already mentioned, are three more shields, a large central and two side ones; the side ones are respectively 18—75, whilst the central one we take to be the arms and crest of the Greenwood family. The pitch of the roof is, as may be inferred, very high, in accordance with the rest of the style.

Before we enter into details we may as well mention that the basement is for store-rooms and the packing and receiving of goods. The ground and first floors as show-rooms, of which more directly; and the second and third floors, as store-rooms for the superior classes of goods, the roof being turned to account as a clock-chamber. The building is in best stock-brick work, dressed with wrought Bath and Portland stone, the roof being covered with plain tiles. The floor of the basement is concreted and asphalted, so that no damp nor vermin can possibly make a lodgment. The day-lighting below is by front and back windows, whilst the first floor is lighted by ceiling lights in its projection a little from the upper part at the back. The roof-lighting is by dormer windows, as is usual in high-pitched roofs. The site has been dug out of a deep slope, upon which stood some remains of the old “slums” of that part of Clerkenwell; and it is a singular fact that, notwithstanding its immediate proximity to the old “Clerk’s Well,” “Oldbourne Bridge,” and the “River Fleete,” not a single article of archaeological interest was found; not even so much as the always-discovered “tobacco pipe, sir, as the ancient Roman army used to smoke along with Joolys Seezur.” But, notwithstanding this, something rather costly was unearthed, the disposal of which is well worth seeing by those interested in building upon very old upland sites. This something was neither more nor less than a sewer, below which the basement floor had to go about 25 ft. We were told that upon this unexpected discovery the architect raised his eyebrows and opened his mouth in a manner that only very clear photography could adequately reproduce. However, as the sewer belonged to that tremendous power, the Metropolitan Board of Works, it would not sink out of sight by being gasped at; nay, more, its protectors would not allow it to be turned a single inch out of “the even tenour of its way,” for all the architects and clocks in London. The best thing that could be done was done; that was that a 12-in. iron pipe was knee-dropped from the sewer’s level, carried into the main basement, belied at a height of 7 ft. from the floor, and run into the sewer in the street. And all for the small sum of 200*l*. That is what people get for meddling with old sewers under the guardianship of great boards. Again, in consequence of this peculiarity of the sewer, the drainage of the premises has to be conveyed into a well and pumped up every day or so into one of the affluents of the Fleet, at an expenditure of 50*l*. a year. The excavation of the whole site produced about 5000 loads of earth.

The door of this large building is on the right-hand side, up a few steps, and opens into a small lobby. Passing through the doors of this lobby, we are in front of the inquiry and delivery counter, having, on the right, a large, commodious glass room, as the counting-house. There is a capital arrangement here that might be considered worthy of imitation; it is this: under the window furthest from the main door, on that level, is the goods entrance from the street to the basement. Between the top of the basement window and the bottom of the counting-house window an opening has been cut and glassed on the inside, commanding a full view of the basement entrance. The consequence of this is, that it is impossible for any one to pass that entrance without darkening the counting-house opening, and so drawing attention to whoever is going down or coming up from the stores and packing-rooms.

We now take a survey in front of us, and see an extensive apartment, 40 ft. by 70 ft., shelved and counteracted along its sides, whilst from its centre rises a noble Gothic staircase to the floor above, entering that floor through a large square opening, giving the appearance of galleries above. This staircase, and, indeed, all the wood-work, is made of varnished pine, which produces a very chaste effect. Passing towards the right, we come upon the watch department, occupying three sides of a small square. Here all the watch nationalities are to be found from both sides of the Atlantic challenging attention. Passing down the right-hand avenue we come upon the Anglo-American clock collection, very full and very diversified in size, shape, and quality. From the end of this avenue runs a cross one, having upon its counters musical and fantastic clocks from the Black Forest, and Vienna regulators. Under one glass case was an artificial rose-bush, and when the mechanism was set in motion a bird, sitting on its nest, flapped its wings, another began drinking at a running fountain, whilst a third warbled forth delightful music. Again, another clock, in an artistically-carved case some 4 ft. high, chimed the quarters, struck the hours, and as soon as the hours had struck a pair of gates flew open and two buglers, in Highland regimental full dress, came to the front and sounded the “assembly” upon their bugles—at least, they *seemed* to do so, the visual deception was so good. A third clock showed a ship in full sail going out of harbour, a church on one side of that harbour, and a sentry walking round within the battlements of a tower on the other, whilst a perpetual express railway train rushed along the summit of the precipitous rocks in the background.

Passing by this collection we enter upon the English and French departments, where the retail dealer may select to his heart’s content and his purse’s lowermost depth. The Vienna regulators, too, in their long, black cases, take up a “slice” of this avenue. We next come to the “lift,” which runs from the basement to the top-most story. Its safe load is half a ton, and it is worked by hand on an endless rope, having stopping-power and safety clutches, in the event of the main rope breaking.

Ascending the large staircase, we find a great embarrassment of riches. Immediately facing us are the private offices of the firm, screened and glass-paned in true Gothic style, presenting a very effective appearance. On looking around we find the apartment of the same dimensions as the one below; but here all is quiet, all is still, for this is the art treasure-chamber of the establishment. Here are clocks in malachite, clocks in alabaster, clocks in marble, clocks in bronze, and clocks in golden fretwork. The customer can be gratified here up to, we believe, 250 or 300 guineas. A man of artistic culture, and a well-fed cheque-book, would have great self-struggling in moving round this richly-stored apartment in keeping his name off his paper. We cannot particularize much, because the place would require a descriptive catalogue to itself. All we can say is, that it would be difficult for any one in the trade not to find here what would suit his customer. At the further end of the room is the musical-box department, where melody and mechanism can be enjoyed to the greatest perfection; in fact, whole orchestras can be heard, singly, in pairs, in companies, in battalions, or all together.

As we have written for the information of the trade exclusively, we presume that the trade will see for itself. There are 40,000 clocks and watches to choose from, and that’s something. Behind the main building are workshops, stables, and a dwelling-house. The whole establishment is heated by a hot-water apparatus by the Messrs. Bacon, whilst the lighting is on the ventilating system of Messrs. Benham & Sons.

As we have already indicated, it is the first large erection of the kind in Great Britain that has been specially thought out and designed for its particular purpose.

The building was erected by Mr. Nightingale, of Albert Embankment, from plans made by the architect, R. Plunbe, Esq.



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HOROLOGY.

(Continued.)

XII.—DIALLING.

IN Article XI. we concluded our instructions with reference to the octagon block, upon the several faces of which, as suitable for our purpose, we drew the lines and angles for six different dials; and, if those instructions are carefully worked out by a painstaking reader of a mechanical turn, we can assure him that he will be well pleased in the admiration that his work will produce when finished. Let us assume that the octagon is finished and mounted; the best mounting is on a circular foot, such as what small globes are fixed on. Then let the block be so placed as that the southern side shall face the south, and the sun will indicate the hours of the day on several dials at once. Another thing, when it is considered that for a common slate dial the price is from 50s. to 60s., such an instrument as the octagon would be intrinsically worth a ten-pound note, a great deal depending on the character of the design and finish. We will now explain the nature of what are known as—

SECONDARY DIALS.—These dials are all those that are drawn on the planes of circles that are neither horizontal, prime vertical, equinoctial, nor polar. They form the class that either decline, incline, recline, or de-incline, as will be subsequently shown.

Declining dials are erect or vertical dials, which decline from east, west, north, or south, as the case may be. Furthermore, they are such as cut either the plane of the prime vertical or of the horizon at oblique angles. We may mention, by the way, that the use of declining dials is of frequent occurrence, for this reason, that

the walls of buildings and gardens upon which dials are usually drawn commonly deviate from the cardinal points of the compass. The different kinds of declining dials take their names from the compass-points to which they severally belong, or, rather, from which they have a real declination. Thus, there are south declination, north declination, and even declination from the zenith. One of these will afford scope for a problem in trigonometry, thus:—

1. The declination of the plane, and the elevation of the pole of the place being given, to find the angle formed in the centre of the dial by the meridian and substyle. The rule is as follows:—

As the whole sine is to the tangent of the complement of the height of the pole, so is the sine of the angle of the declination of the plane to the tangent of the angle required.

2. The declination of the plane being given, and the elevation of the pole of the place, to find the angle formed in the centre of a vertical declining dial, by the substyle and axis.

RULE.—As the whole sine is to the sine of the complement of the elevation of the pole, so is the sine of the complement of the declination of the plane to a side to be presently explained, the sine of the angle required.

3. The declination of the plane, and the elevation of the pole given, to find the difference of longitudes; that is, the arc of the equator comprehended between the meridian of the place and the meridian of the plane.

RULE.—As the whole sine is to the sine of the height of the pole of the place, so is the tangent of the complement of the difference of longitudes.

4. The angle of the difference of longitudes, and that of the axis, with the substyle being—to find the angles formed in the centre of a vertical declining dial, between the substyle and hour-lines.

This last-named problem takes in three cases, in this wise:—The

hour-lines, whose angles are sought, may be—(a) Between the meridian and substyle; or (b) Beyond the substyle; or (c) On that side of the meridian where the substyle is not. In the (a) and (b) cases the difference is to be taken between the sun's distance from the meridian at that hour, and the angle of the difference of longitudes, found by the last problem; and in the (c) case the sum of those two angles is to be taken, and the following rule applied:—

As the whole sine is to the sine of the angle between the axis and substyle, so is the tangent of the difference of the sun's distance from the meridian and the difference of longitudes, or of the sum of those two angles, to the tangent of the angle required.

5. The angle formed by the substyle, with the hour-lines, and that of the substyle, with the meridian given; to find the angles formed between the meridian and hour-lines in the centre of vertical declining dials.

A. The angles of the hour-lines between the meridian and substyle are found by subtracting the angle formed by the substyle with the hour-line from the angle formed by the substyle with the meridian.

B. The angles beyond the substyle, and on the opposite side to that of the meridian, are found by adding those two angles.

C. Those on the other side of the meridian are found by taking their difference.

Such are the five general propositions that are laid down as necessary for the construction of a vertical declining dial trigonometrically, and we will here give a few directions for their practical application.

Draw a horizontal line and mark it H—P. At half distance on the left-hand side draw a perpendicular and mark it A N; from A, to cut through the centre of the line H—P, draw another one, marking its lower extremity M, and from P, again, draw an oblique line to the left that shall cut the perpendicular A N at N. From G draw an oblique line to the right, cutting the line P at the same distance from N that G is from H, and back again with another line to cut the horizontal at the centre of that line and mark it D. The point of this angle—to speak plainly—that cuts the line P mark as F. You will now have a triangle G F D. G F is the height of the pole of the place, so is the sine of the angle of the declination of the plane G F D to the tangent G D of the angle required, G A D.

We may as well mention that, in describing the trigonometrical method of laying down the kind of dial under consideration, we have assumed that those who intend trying it are somewhat acquainted with the definitions of geometry. As there may, however, be one or two who would like to burnish up “nicely” for this particular purpose, we will help them a little before we conclude this article. We all know that any common object is geometrically termed a solid, and that a solid has surfaces. These facts establish the conclusion that the boundaries of surfaces are called lines, so that there is no need of any mathematical definition in that direction. Where lines begin and end such extremities are called points; and, also, where they cross, or “intersect” one another. Again, surfaces are called either plane or curved. Plane, in this sense, means even, or level, such as a table or a floor; whilst curved means rounded or bent. From this it follows that, as with surfaces, so with lines, they are either straight or “right” lines, or curves. By the peculiar action of the rays of light from an object acting through the eyes upon the brain, we are enabled to know, according to the nicety of our sight, the value of what we are examining. A straight line has been mathematically defined as that which lies *evenly* between two points; although, as this world continues to “raise” people who are expressly born to “cavil on the ninth part of a hair,” so that definition has been disputed. For ourselves we are quite satisfied with it as it is.

From what has just been stated it will be understood that workmen looking along a right line with one eye closed can see instantly whether it is perfectly straight or not. When we were on a visit to the rifle factory at Enfield we saw one whose sole business it was to “tap” rifle barrels on an anvil with a hammer, and then, after each tap he would raise a barrel to his eye and look along it. He was the straightener, for no machine could equal his tap and his eye. We will now speak of an angle. Any two straight lines touching each other, form an angle of *some kind*, which any shilling book on the subject will easily explain. As there are curved lines as well as straight ones, so we have curved angles and straight ones. This condition of things, again, leads on to spherical trigonometry and plane trigonometry. The purpose of plane trigonometry is the calculation of the value of *plane* triangles, as the other is of spherical triangles. It is with plane triangles chiefly that dialling has to deal. The *complement* of an angle consists in its difference from a right angle; the latter being one straight line cutting through, without

leaning to the right or to the left, another straight line. The *supplement* of an angle is its difference from *two* right angles. A *sine* may be taken to be a straight line drawn perpendicular to the diameter of the circle, from one extremity of an arc to the other. As these are the principal terms the least likely to be understood by the non-geometrical reader, so far as dialling is concerned, we need not demonstrate the construction and properties of chords, tangents, secants, &c., but will credit the reader with a sufficient acquaintance with them.

SOUTH KENSINGTON SCIENTIFIC EXHIBITION.

WE visited this Exhibition up to the earliest practicable time before going to press, and saw that everything is in a very advanced state. In looking over the list, however, we found some well-known names “conspicuous by their absence.” As the galleries are to be publicly opened on the 12th instant, we suppose that those who have not already put in an appearance do not intend doing so. We saw much to admire, and heard something to regret.

Amongst the fullest and most scientific contributors is, as might be expected, the Horological Institute. It will show a series of drawings by the Art Classes of all the recognized escapements, both in their entirety and in detail; there will also be a considerable display of the same articles in a finished state, and an interesting collection of springs. But there are the elements of a storm-cloud overhead. It appears that the Council of the Institute has taken great umbrage at learning that finished chronometers, and other things devoid of pure scientific interest have been accepted; as the Institute looks upon this as tending to make the Exhibition a kind of bazaar, it has been under consideration to withdraw from it altogether. We sincerely hope, for the sake of horological art, that this will not be done. The United Service Institution will show the timekeeper that accompanied Captain Cook in his explorations; and the Naval Museum, Greenwich, will also put in an appearance. Of private exhibitors, Messrs. James Poole & Co. will have by far the largest collection; that will consist of chronometers, chronometer movements, and keyless mechanism; we are promised something worth looking at, and need not fear disappointment. Mr. A. J. Higham has a regulator with a new form of gravity escapement; Messrs. Charles Frodsham & Co., of the Strand, have another regulator, and marine chronometers; and Osnaghi, of Vienna, presents some new electric clocks. Major Taylor, R.M., shows a four-dial water-clock, whilst another gentleman has produced a real clepsydral escapement. Mr. H. W. Ley has a new kind of compensated pendulum, and a gravity escapement. The Commissioners of Patents have sent in an ancient striking clock; and the Messrs. Ritchie, of Edinburgh, are going to show what the modern Athens can do in the way of regulators. There will be some electro-ballistic chronometers, to show how the flight of shot is measured, whilst the now historical clock that M. Foucault used in his celebrated pendulum experiments in the Pantheon, at Paris, to prove the axial revolution of the earth, will be shown. Hamburg is in great strength; and so are other places in Germany. Both astronomical and meteorological instruments will be sure to attract a large amount of attention. We cannot at present, for obvious reasons, say more, but hope to describe matters more fully when the Exhibition is opened to the public.

IMPORTANT NEW ROUTE AND SERVICE OF TRAINS TO SCOTLAND.

THE Midland Railway Company having opened the Settle and Carlisle line, a new and important service is thereby afforded between England and Scotland, and which addition to the vast extent of service of this popular line will give numerous facilities and advantages to those travelling in that direction. Carriages of improved description and with all modern appliances will be run direct between St. Pancras (London), and Edinburgh and Glasgow.

The route is one which has, for a considerable time, been greatly needed, and will doubtless receive the greatest share of public patronage, as with the usual energy and liberality of this company every detail has been carefully considered which can possibly add to the comfort and convenience of the traveller.

THE WORCESTER CATHEDRAL CHIMES.—Two additional, or half-tone, bells, the gift of Mr. C. W. Lea, have been added to the Worcester Cathedral Chimes, enabling arrangements to be made for completing the twenty-eight tunes which the carillon machine was originally constructed to play.

PRECIOUS STONES.

(Continued from page 171.)

AVENTURINE.

It is said that the accidental discovery of the artificial composition of a red vitreous substance, sprinkled internally with bright gold-coloured filings, and similar to the quartz much used in jewels of the peruke period, caused the name of aventurine to be given to both, merely distinguishing them by the addition of *artificial* or *natural*.

Scientifically speaking, one cannot, from such a term, understand one special stone, since the agate, jasper, chalcedony, rock-crystal, opal, and even the commonest fluete of lime, exhibit at times the golden filings, and therefore, as with respect to the asteria, so with the aventurine, there are stones of every species which receive this name from the accidental quality above mentioned.

Thus Borson had a chalcedony covered internally with a golden sand; it was aventurine chalcedony. Bossi describes a garnet jasper with small golden dots; it was an aventurine jasper. In New Granada a similar stone was found, there called pentaura; it therefore is an aventurine stone.

We are of opinion that the aventurine quartz is the stone described by Pliny under the name of *sandastro*, which some people call *garamantite*. It is found in India, in a place of the same name; and also in Arabia. The greatest beauty consists in the drops of gold which always sparkle inside, but never on the surface.

Some people esteem the Arabic more than the Indian stones. There are two qualities of aventurine quartz, of which the most common, which has marks of yellow mica, or Muscovy talc, is found on the shores of the White Sea, in some mines of Silesia, of Bohemia, France, and Siberia; the other, more rare, has bright reflections from minute chinks, and is found in Spain and Scotland.

Its specific weight is from 2.6; it slightly scratches rock crystal, has a bright light, does not acquire electricity from heat, and has no power over the magnetic needle. The ground colour is generally russet-brown, but there are some of yellow, grey, reddish-white, and green with black and white marks. However, aventurine quartz has two different aspects, viz., semi-transparent and opaque; the first has the exact specific weight of 2.6670, the second 2.6426.

The great demand for aventurine quartz, when it was fashionable, originated the idea of making the stone artificially. I do not believe that chance could, by an accident happening to a workman, make such a fine combination; therefore, with many modern authors, I claim the glory for Miozzi, who, in the infancy of modern glass work, after long study, was the first to make an aventurine glass, which, excepting in hardness, excelled all other aventurine stones. He, however, was jealous of his secret, which he carried with him to the grave.

After many years, in 1827, another Venetian, named Bibaglia, with infinite labour and perseverance, succeeded in composing a yellowish-brown enamel, tolerably consistent, but very easily melted, and superior to all other aventurine in beauty. Its analysis gives—

Silex	...	...	...	...	...	0.652
Phosphoric Acid	...	...	...	...	...	0.015
Deutoxide of Copper	...	...	...	...	...	0.030
Protoxide of Iron	...	...	...	...	...	0.065
Lime	...	...	...	...	...	0.080
Magnesia	...	...	...	...	...	0.045
Soda	...	...	...	...	...	0.082
Potash	...	...	...	...	...	0.021

This, however, like all chemical analyses, is not the formula for the real composition of this substance.

AXINITE.

The name of this mineral is derived from the Latin *axis*, the edge of the axe, and was given to it because its crystalline form resembles that utensil. It is also called *Thumerite*, from the name of Mount Thumor, where it was first procured. It is found in great agglomerations, and in somewhat different forms, which may, however, all be reduced to the rhomboidal, that is, to an oblique rhomboid, or prism with four sides, so much compressed as to make the angle so sharp that it resembles the edge of an axe. It is translucent, and sometimes transparent; it has single refraction; its light is vitreous and resinous; its colour brown, violet, blue, grey, or yellow. It scratches glass, but is scratched by the topaz; it yields a whitish powder; its specific weight is from 3.27. It becomes electric when warmed or rubbed; under the action of the blow-pipe it melts into a brown-grey glass; acids have no effect on it and it is composed of lime, alumina, and silex, with oxide of iron

and manganese. It is found, principally in primitive rocks, but also in others of different formations, in the Dauphiné, in the Pyrenees, in Norway, and at St. Gothard. This mineral, especially that from the Dauphiné, takes a beautiful polish.

BERYL.

The stone which the ancients named beryllus is none other than that now called aqua-marina, of Ceylon, of which we have already spoken.

Compared with other gems, the beryl is but little prized at the present day, being procured in great abundance and found in all parts of the globe; whereas the ancients had it only from India, and prized it as much as the emerald, with which they even confounded it; so that the enormous emeralds of which Theophrastus and Apion speak are now thought to have been aqua-marina, as this stone is found in very large pieces.

There are very few undoubtedly antique intagli in this stone, and they are as rare as those on the emerald. Generally the engraved graven beryls are Ionian work, whereas the engravings on emeralds are Roman. But, although the Romans did not engrave the beryl, they faceted it, and it was the only stone they cut in that manner. They used it for ear-drops and rings. When the shade of Cynthia appears to Propertius, he remarks that—

"Et solitam digito beryllon adederat ignis."

Here we may remark, it appears that the ancients applied the term "beryllus" also to a magnifying-glass, and perhaps they used aqua-marina for the same purpose.

This supposition is rendered probable from two reasons: the first is that in the German language spectacles are called "*brille*," and no other derivation has been found for this word than the Latin "*beryllus*;" the second is that Nero is said to have looked at the spectacle in the theatres through a very large emerald.

We have already seen how easily the ancients confounded the emerald with the beryl, and therefore we do not think it unlikely that Nero's emerald was an aqua-marina cut for the purpose of a magnifying-glass.

In corroboration of the above, we bring to the notice of the reader the fact that Nicola de Cusa, Bishop of Brixen, who died in 1454, gave the name of "Beryllus" to one of his works for this reason, that "by means of its assistance, people could understand things otherwise incomprehensible;" and in the second chapter he expressly says, "The beryl is a bright, colourless stone, to which a concave or convex form is given by art, and by means of which whoever looks through it sees things otherwise invisible to the naked eye."

BRITISH HOROLOGICAL INSTITUTE.

At the April meeting of the Council of the above Institution it was announced that three competitors for the prize offered by Mr. S. Jackson had sent in, by the stipulated time, tools for measuring the angles of lever escapements, and an anonymous letter, addressed to the Council, asking, on behalf of a would-be competitor, for an extension of time, was read. It was, however, decided that the advertised conditions should not be disturbed, and that the prize should be awarded by three adjudicators. Mr. Bacon and Mr. Tilling were appointed to act in that capacity, in concert with some gentleman to be named by Mr. Jackson. A statement was made respecting the position occupied by the Institute in connection with the Loan Exhibition of scientific objects at South Kensington, by Mr. Glasgow, who, on visiting, with the Secretary, the rooms set apart for the exhibition, found that finished chronometers, show cards of chronometer manufacturers, and other articles of no interest in a scientific point of view, had been sent for exhibition. Mr. Glasgow said that, although the Institute had taken considerable trouble in making a collection of compensation balances, &c., and had sent a list to the South Kensington authorities, it would not, he thought, be out of place, under the altered state of things, if the Council would consider the propriety of withdrawing altogether from what appeared likely to degenerate into a bazaar. It was, he considered, a breach of faith to ask the Institute to prepare objects of scientific interest, and then to invite members of the trade to send in whatever they chose. Eventually, it was decided that the whole matter should be left to the discretion of Mr. Glasgow.

A UNIVERSAL Exhibition of Fine Arts, independently of the Annual Exhibition of the Works of Living Artistes, will be opened in Paris, on the 1st of May, 1878, and will be closed on the 31st of October following. An ulterior decree will determine the conditions of this Exhibition. The Minister of Public Education and of Fine Arts is charged to carry out the present decree.

A TREATISE ON PITCHINGS.

(Concluded.)

XXXIV. There remains now only to treat of the pitching of contrate or crown wheels, under these conditions that the wheel should drive a pinion C, or be driven by this pinion.

It is necessary to consider the circumference of the wheel in the place where it acts as a right line, perpendicular to the axis of the pinion, and consequently to suppose that the tooth of the wheel which acts upon the leaf is moved in a plane perpendicular to the axis of the pinion, just as if it were a straight rack or toothed ruler. It is true that this supposition is not exactly correct, above all, if each leaf of the pinion be driven a little too far, that is to say, if the pinion be low numbered, because the driving point will be a little nearer the centre of the wheel towards the end of the driving than it ought to be if the circumference of the wheel were rectilinear; this difference will be nearly equal to the versed sine of the arc which the wheel described from the line of centres to the end of the driving (which may be extremely small), there will then result a slight friction of the direction of the axis of the pinion, but it is hardly possible to pay any attention to it in theory without a very complicated calculation, from which little advantage can be derived in practice.

XXXV. Let us then suppose a right line C A (Figs. 1 and 3) movable from A to C, and which causes a circle A to move round its centre; we understand by that which has been said in Articles IX. and XII., that this circle will describe by its point, E on the plane, which we suppose moved itself with that line, a cycloid C E D: and that the line A E, drawn from the point of contact A to the describing point E, will be always perpendicular to that cycloid.

If we desire to give to the line C F, teeth, by means of which it can drive the pinion represented by the circle A, by a point A considered as a stave infinitely drawn out into a thin line terminating in this point, it will be necessary to give to those teeth the form of a portion of the cycloid A K (Fig 3). At the same time we can imagine that if the line N M, (Fig 10), represents a portion of the primitive circumference of the contrate wheel, which ought to drive a pinion of which the leaves O R D are radii

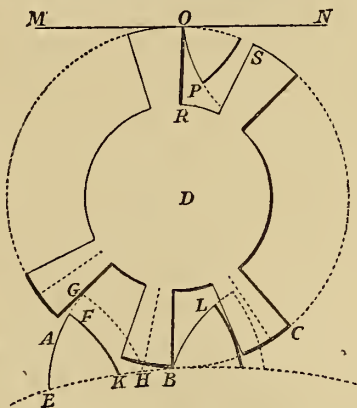


FIG. 10.

of the pinion, the teeth of this wheel ought to be portions of the cycloid O P, described by the revolution of a circle, of which the whole diameter is equal to O D, on the line O N.

In effect we ought to say in this very case all which has been said in the others, and above all in the general proposition, Article XXXIII.; that is to say, the same circle ought to roll within the pinion O S, in order to describe the leaf O R, and on the wheel O N, to describe the tooth O P; the right line being nothing else than a portion of a circle, of which the radius is infinite.

XXXVI. The method which we have followed for the sake of determining the preceding curves does not possess the advantage of being able to determine the form of a tooth fitted to drive any leaf whatsoever of a given figure, as M. de la Hire has done, although in a manner not over lucid.

M. de la Hire had perceived the advantage which might often be gained by employing *roulettes*, in the place of staves or leaves of pinions, in machines where there exists a tendency to great friction; he wished therefore to discover the form of teeth adapted to drive these *roulettes*. Let the pinion D K, (Fig. 11.), which ought to be driven by the wheel K B, and which carries the *roulettes* D, be the epicycloid B D, which will serve to drive the point B; in order to find the curve G H fitted to drive the *roulette*, of which the radius is D F, it is only requisite to describe from all points in the curve B D small circles of which the radii shall be equal to D F, and to draw another curve G H, which shall touch them all; this curve will be parallel to the epicycloid B D, and will produce always on the point F of the *roulette* the same force and the same velocity as the epicycloid B D would produce on the point D; it will

likewise have the same force, since the line D K is alike perpendicular to the epicycloid, the *roulette*, and the curve G F.

XXXVII. By a similar method it is possible to find the curve fitted to drive a leaf A G (Fig. 12), which shall be a radius of the primitive circumference of the pinion B G. From the point B,

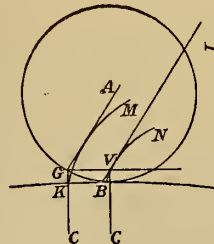


FIG. 11.

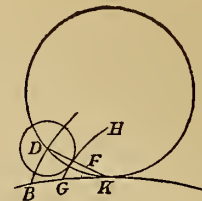


FIG. 12.

taken in the line of centres, we describe the epicycloid B V N, which will serve to drive the point B, as in the Article XX.; and through the extreme end G of the leaf of the pinion, when arrived at G, we describe the arc of a circle G V, which has the same centre as the wheel B K; at the point V, where this circle will cut the epicycloid, draw the line V I, which will make, with the radius C V of the wheel, the angle C V I equal to the angle C G A; we must do the same thing for all the points where the leaf G can be met with, and the curve which will touch all the lines, V I being applied in the direction K M will produce on the leaf A G the same effect as the epicycloid B V N would have produced on the point G; for the line V I will coincide with G A, which will become the tangent to the curve at the driving point, in such a way, that the movement of the leaf B G will be precisely equal to the movement of the point B, if it had been driven by the epicycloid B V N.

XXXVIII. In this manner it is possible to suppose for the leaf of the pinion every other curve, ellipse, parabola, hyperbola, &c., placed in any manner whatsoever, and find mechanically the shape of the tooth adapted to drive it uniformly; but these researches would be more curious than useful, and notwithstanding the universality of this method, that which we have given a full account of is infinitely more preferable, in that it serves to exhibit the nature of the curves we employ, and the point of the tooth which at each instant acts upon the pinion.

XXXIX. The same curves may be employed in machinery on various occasions; for instance, the leaves or cams of a mill-shaft placed horizontally, and which raises the hollow or solid pistons of pumps, powder and paper mills, fulling mills, hammers for forges, floats of wheels used in certain hydraulic machines, wards on the nose of a key-bit, cut in such a way as to be able to overcome the resistance of the springs, and make it impossible through their means for the locks to be opened except with the particular key; they may also be applied to the bevelled edge of the bolt, which ought to rub against the staple of the lock in order to facilitate the closing, and in many other circumstances which bear no relation to my subject.

XL. The principles which clockmakers have followed up to the present are very far off those which we have endeavoured to establish; there has been always much difference and uncertainty in their methods, or rather they have never had any defined method. In Germany pinions are made lantern-shaped; in France, like grains of barley; in England, thin flanked—that is to say, with leaves flattened on the sides. It would appear that fashion has done all, and that experience has not taught a single thing. A very skilful clock-maker has said that all the rules relating to this subject may be reduced to the gaining of force, and the avoiding of *side pressure* or friction. In order to gain force, he gives to the leaves of the pinions the form of staves of a lantern; that is to say, the most circular possible, provided that they be always driven by the point most distant from the centre. This is all which could well be proposed for the best in default of not going back to those true principles which demand the aid of geometry. In order to avoid side pressure or friction, the same artist requires that the set of teeth of the wheel (or rather the wheel) be more spaced than filled up; but these two considerations furnish nothing precise, they were on the whole but feeble precautions.

XLI. By that which has been said, we can understand why clockmakers exact that pinions which lead should be made larger than when they are driven; for whenever a pinion leads a wheel, if the teeth of the wheel were as large as those of the pinion they would not be able to disengage themselves.

XLII. It would therefore be of advantage to all clockmakers to trace, according to the method we have laid down, templets or callipers for the different sizes of the wheels and pinions they employ; by this means they would soon have the hand in to that form most advantageous in the shaping of the teeth, and would not lose anything by being able to accomplish their work with ease.

It is usual to advance, as an argument against all new methods, the difficulty of execution, no matter how advantageous they may be. There is, however, a great deal that is arbitrary in this difficulty, for it almost entirely depends on the habits which a great or small number of workmen have contracted in some part of the work; everything which has actually turned out to be easy appeared at its first origin to be impracticable, and all which to-day appears unusual and difficult will become, in the course of time, easy and commonplace.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 195).

PIERRE AUGUSTE CARON DE BEAUMARCHAIS, born at Paris, in January, 1732, was the son of Caron, a watchmaker of that city; and was by his father brought up to the same profession, in which he showed considerable skill, gaining a prize from the French Academy of Sciences for an improvement in watchmaking when only twenty-two years of age (a detailed account concerning him has been given in a previous number of this journal).

In *Scots' Magazine* for October, 1747, are the following lines on a watch, by Mr. J. Byrom, commonly called Dr. Byrom, the inventor of a system of shorthand, and they are to be found in his printed works. The same lines are attributed to T. Hall, in 1739. They appear without the author's name in the *Gentleman's Magazine* for May, 1749—

"Could but our tempers move like this machine,
Not urged by passion, nor delayed by spleen,
But, true to nature's regulating power,
By virtuous acts distinguished every hour;
Then health and joy would follow as they ought
The laws of motion and the laws of thought,
Sweet health to pass the present moment o'er,
And everlasting joy when time shall be no more."

On the face of a very old watch, the outer case of which is of gold of the finest workmanship, encrusted with precious stones, is represented in enamel a landscape, with a single figure, apparently that of a traveller. The sun is disappearing behind a range of mountains, and the legend round it, in raised letters, is "*Vada e vengo ogni giorno, ma tu andrai senza ritorno*," supposed to be addressed by the sun to the traveller.

The *Gentleman's Magazine* for 1748 gives an account of one of the Marquis of Worcester's projects, which was "a watch to go constantly, and yet needs no other winding from the first setting on the cord or chain, unless it be broken, requiring no other care from one than to be now and then consulted with, concerning the hour of the day or night; and if it be laid by a week together it will not err much, but the oftener looked upon, the more exact it shows the time of day or night." This seems to have been a project for a machine to measure time by perpetual motion—the will-o'-the-wisp of many mechanicians in past ages. In the same magazine, for the following year, we find a suggestion to watchmakers, as to the construction of a watch which should move always without winding up.

The celebrated French physician, Pinel, relates the case of one of the most eminent watchmakers in Paris, at the end of the last century, who was infatuated with the chimera of perpetual motion, and to effect this discovery he set to work with indefatigable ardour. Through unremitting attention to the object of his enthusiasm his mind became completely deranged. He imagined that he had been guillotined, that his head had been mixed with those of some other victims, and that the judges, repenting of their cruel verdict, had ordered the heads to be placed on their respective bodies. By some mistake, he conceived that the head of one of his unfortunate companions had been placed upon his shoulders; and this idea haunted him day and night; but in his madness he zealously prosecuted his endeavours to obtain never-ending motion with the aid of watch-wheels and other mechanisms. A person of a lively and jocular turn was engaged to play the following trick upon the demented horologist. Their conversation was directed to the celebrated miracle of St. Denis, who carried his head under his arm and kissed it as he went along. The watchmaker vehemently maintained the possibility of the fact, and endeavoured to confirm it by an appeal to his own case. His companion burst out into a loud laugh, and said to him, in a tone of mockery—"Why, you fool, how could St. Denis contrive to kiss his own head? Was it

with his heel?" This unexpected repartee struck the lunatic forcibly; he retired quite confused, amidst the laughter that it produced; and he never after spoke of the misplacement of his head.

In 1753 a watchmaker, who was also an astrologer, was living in Bloomsbury. About this time a base girl, named Elizabeth Canning, trumped up a false tale about a gipsy, alleging that under Bethlehem wall she was seized, robbed, and gagged, and thence dragged to Mother Wells's, and Eufield Wash, where she was nearly starved to death. The affair caused great excitement for more than twelve months; but ultimately the girl was tried and convicted of perjury, and sentenced to seven years' transportation, on May 8th, 1754. A soothsaying horologist cast her nativity; but he was out in his reckoning, as will be seen by a comparison of the before-mentioned facts with the following predictory advertisement which appeared at the time:—

"As by an advertisement, April, 1753, I was confidently sure; from the nativity of Elizabeth Canning; that her case was certainly true; from two directions that came up at that time; one the Midheaven to the Square Moon; Lilly 676, viz., it produces the disesteem of the commonalty, thwarting and contention; by base and unworthy women; lost of honour; it produces the sentence of some magistrate or judge against them, &c., the other the Moon to the Opposition of Saturn; he is Lord of horrible misrule and tragical mischief; all manner of mischief that can be devised; divers positions concur, to the like effect, so as to prove it a truth beyond contradiction, testified by numbers of the most learn'd men from experience in all ages; from the application of Mars to Jupiter the 30th day of this month; who is esteem'd the Worker of Justice; I verily believe, and doubt not, that Elizabeth Canning will by then be freed from all the dangers she labours under. JOHN HARMAN, Watchmak'r, Bloomsbury."

Charles III. of Spain, who commenced his reign in 1759, established in New Castile a mechanical school, of which the avowed object was to form eminent proficient in the useful art of dialling and watchmaking; but a writer in 1809 tells us that up to that time it had not produced a single pupil. At the King's College at Madrid was also a school for mechanics, in which the pupils were particularly initiated into the mysteries of watchmaking, and early in the present century this institution was under the superintendence of the brothers Charost. However, the mechanical arts have never been held in high estimation in Spain, and when pursued there have not obtained much success. We do not find that it has ever supplied any important horological mechanisms.

In the South Kensington Museum is a minute watch in the form of an apple, in a gold enamelled case, surrounded by a belt of seed-pearls. The stem or handle is in gold filigree work. It is of Geneva manufacture, about 1760. It was purchased for 7*l.* 14*s.*

We read in the *Gentleman's Magazine* for 1762, under date May 29th, that "Mr. Peyton, dry fish monger, opposite the water house, London Bridge, received by the Chester stage coach a parcel, carriage paid; this when opened appeared to contain a gold watch in a shagreen case, with a gold chain and a red cornelian seal set in gold, which had been given to his wife by her father, and had been lost between eight and nine years from her bedside. Immediately after the losing it Mr. Peyton made use of all common methods of endeavouring to recover it, by advertisements, hand-bills, &c., but to no purpose; till at length he had it in this manner most unexpectedly restored to him very safe, and without seeming to have met with any injury during the whole time it was missing."

IMPROVEMENT IN SPECTACLES.

THE pantoscopic tinted spectacles on Dr. Menist's principle, and of which Messrs. S. J. Lazarus & Co., of 129, London Wall, are the sole manufacturers, possess many valuable advantages, one of these being that they enable the wearer to see distant objects without removing the spectacles. It is well-known that if distant objects are viewed by the same ordinary spectacles used for reading, writing, &c., the sight is very greatly impaired thereby, and that the wearer is compelled to frequently change his glasses for those of stronger magnifying power. The spectacles under notice obviate these difficulties, and are fitted with Penscopic tinted lenses, so that the wearer can see therewith to better advantage than with the glasses generally used, and they can be used for many years without it being necessary to have them changed for those of greater magnifying power.

They are admirably adapted for shading the eyes from the sun, fire, gas, or other bright lights, and consequently greatly add to the preservation of the sight. These spectacles are registered, and bear the stamped mark S. J. L. & Co., and will be found a boon to all those requiring their use.

FINGER RINGS

(Continued from page 255).

THE custom of placing initial letters on rings is a very old one. They are sometimes surmounted by crowns or coronets, hence they have frequently been mistakenly appropriated to royalty. Rings of this kind, with a crowned *I* upon them, were once called "King John's rings." It is most probably the initial of the Saviour's name as King of the Jews, in the same way that the crowned *M* may indicate the Virgin Mary as "Queen of Heaven," a favourite popish designation. Such rings may have been worn from religious feelings or from the superstitious belief of the efficacy of holy names as preservatives from evil. The baseness of the metal of which they are often made, and their consequent small value, precludes the possibility of their having belonged to royalty. The same remark will apply to a ring also engraved in the *Journal* of the Archaeological Institute, and now in the possession of the Rev. Walter Sneyd. It is there described as of mixed yellow metal gilt; on either side of the hoop there is a crown of the form commonly seen on coins of the twelfth century, and on the signet are the words, ROGERIVS REX, chased in high relief. In the form of the character they correspond closely with legends upon coins of Roger, second Duke of Apulia, of that name, crowned King of Sicily A.D. 1129; he died A.D. 1152. This ring has every appearance of genuine character, but it is difficult to explain for what purpose it was fabricated, the inscription not being inserted, and the letters in relief all suited for producing an impression. It seems very improbable that King Roger should have worn a ring of base metal; and the conjecture may deserve consideration that it was a signet not intended for the purpose of sealing, but intrusted, in lieu of credentials, to some envoy. The popular literature of the Middle Ages abundantly proves this custom to have been in general use. The tale of "Ipomydon," in Weber's "Ancient Metrical Romances," notes the gift of a ring to the hero from his mother, which is to be used as a token of recognition to his illegitimate brother, and which is brought secretly to his notice by being dropped into his drinking-horn. In the "Romance of Florence and Blanche-flor" a ring serves the purpose of letters of introduction when the hero is on his travels, and ensures him hospitality when he deserves it.

Rings sometimes bore the name and title of the Saviour in full, as in Fig. 58, from the Londesborough collection; two hands are clasped in front; it was therefore, most probably, a gift, or betrothal ring. It is silver, somewhat rudely fashioned.



FIG. 58.

The inscription (here engraved below it) is in uncial characters, and, shorn of its somewhat awkward abbreviation, reads, "Jesus Nazareneus Rex." The same collection furnishes us with the specimen of a religious ring (Fig. 59), apparently a work of the fourteenth century. It has a heart in the centre, from which springs a double flower. On the upper edge of the ring are five protuberances on each side; they were used to make a certain number of prayers, said by the wearer, who turned his ring as he said them, and so completed the series in the darkness of the night. Such rings are often of very common occurrence, and must have been in general use. They are sometimes furnished with more prominent knobs, as in Fig. 60. They are termed decade rings when furnished with



FIG. 59.

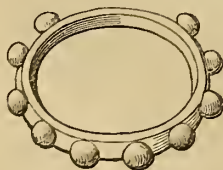


FIG. 60.

ten bosses, which were used to count the repetition of ten Aves, but they are occasionally seen with one or two additional bosses; when they are eleven they notify ten Aves and a Paternoster; the addition of the twelfth marks the repetition of a creed.

Allusion has already been made to the mystic virtues attributed to stones during the Middle Ages, and for the fondness for collecting antique gems. They were coveted not only as works of art, but for their supposed power over the circumstances of life or the welfare of individual wearers. The idea very probably originates with the Gnostics of the East, who engraved stones with mystic figures, believed to impart good luck or to keep off evil influences. So completely had this belief gained hold on all classes, that a Gnostic gem set as a ring was found on the finger of the skeleton of an ecclesiastic, in the Cathedral of Chichester, "affording indubitable evidence that these relics were cherished in the Middle Ages by those whose express duty it was to reprove and check such gross superstition."

This belief was ultimately reduced to a system. An old French *lapidaire*, compiled in the thirteenth century, assures us that a stone engraved with the figure of Pegasus or Bellerophon is good for warriors, "giving them boldness and swiftness in flight," very contradictory qualifications, it must be allowed; one, with the figure of Andromeda, had the power of conciliating love between man and woman. "A gem bearing the figure of Hercules slaying a lion, or other monster, was a singular defence to combatants. The figure of Mercury on a gem rendered the possessor wise and persuasive. The figure of Jupiter, with the body of a man and the head of a ram, made the man who bore it believed by everybody, and he was sure to obtain anything he asked. If you find a stone bearing the figure of a hare, it will be a defence against the devil; if you find a dog and a lion on the same stone, it will be a preservation against dropsy or pestilence. The figure of Orion was believed to give victory in war. If you find a stone in which is Perseus holding in his right hand a sword, and in his left the Gorgon's head, it is a preservation against lightning and tempests, and against the assaults of devils. A stone on which is engraved a long-bearded man sitting on a plough, with a bending in his neck, and four men lying down, and holding in his hand a fox and a vulture, this, suspended about the neck, enables you to find treasures. If you find a dove with a branch of olive in its mouth, engraved in pyrites, and mount it in a silver ring and carry it with you, everybody will invite you to be his guest, and people will feast you much and frequently. The figure of a syren, sculptured in a jacinth, rendered the bearer invisible. A fair head, well combed, with a handsome face, engraved on a gem gave to the bearer joy, reverence, and honour. Such were the qualities attached to ancient gems in the Middle Ages."* Many plain stones were also believed to have magical virtues. Thus, the amethyst prevented drunkenness, and was consequently often set upon wine cups. The crystal clouded if evil was about to happen to its wearer. Amber was good against poison, hence drinking-cups were formed from it. The topaz cured and prevented lunacy, increased riches, assuaged sorrow and anger, and averted sudden death. Such was the faith placed in stones until the end of the sixteenth century. Dr. Donne speaks of—

"A compassionate turquoise, that doth tell,
By looking pale, the wearer is not well."

But the most curious of all these superstitious beliefs attached itself to the crapaudine, or toad-stone. It is most unattractive to sight, of an opaque dirty-brown tint, and known to mineralogists as a variety of trap rock. It was believed to have most sovereign virtues against poison, if pounded and drank; and, like the turquoise, to give warning of its presence by a change of colour when simply worn in a ring. It was believed to exist in the head of the toad. Fenton, writing in 1569, says, "There is found in the heads of old and great toads a stone which they call borax or stelon; it is most commonly found in the head of a he-toad." It was not easily attained, for the toad "envied so much that man should have that stone," says old Lupton, in his "Thousand Notable Things." Hence came a true test for such stones, according to the same credulous author, who thus enlightens us:—

"To know whether the toad-stone, called crapaudina, be the right and perfect stone or not, hold the stone before a toad so that he may see it, and if it be a right and true stone the toad will leap towards it and make as though he would snatch it from you."

"It should be obtained," says a mediæval author, "while the toad is living;" and this is to be done by simply placing him upon a piece of scarlet cloth, "wherewithal they are much delighted, so that while they stretch themselves out as it were in sport upon that cloth, they cast out the stone out of their head, but instantly they sup it up again, unless it be taken from them through some secret hole in the same cloth."†

* T. Wright, M.A., &c., in "Archæologia," Vol. XXX.

† Marsarius, quoted in Topsel's "History of Serpents," 1611.

Lupton, whom we have just quoted, tells us of "a rare good way to get the stone out of the toad," which has the advantage of great simplicity. It is to be done thus:—"Put a great or overgrown toad (first bruised in divers places) into an earthen pot; put the same into an ants' hillock, and cover the same with earth; which toad at length the ants will eat, so that the bones and stone of the toad will be left in the pot." Boethius relates how he watched a whole night an old toad he had laid on a red cloth, to see him cast forth his stone, but the tedious watch was not rewarded; the toad retained his jewel, and he had nothing from thence to "gratify the great pangs of his whole night's restlessness."



FIG. 61.

The Londesborough collection supplies us with two remarkable specimens of rings connected with toad superstition. Fig. 61 is of mixed metal gilt, having upon it the figure of a toad swallowing a serpent. There is a mediæval story of a necromancer introducing himself to another professor of magic by showing him a serpent ring, upon which the latter, who did not desire any one to interfere with his practice, produced his toad-stone ring, observing that the toad might swallow the serpent, thereby intimating his power to



FIG. 62.

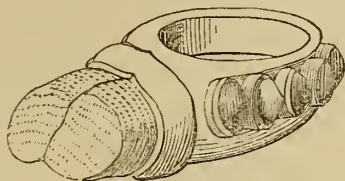


FIG. 63.

overcome him. Fig. 62 is curious, not only as containing the true toad-stone, but also that the stone is embossed with the figure of a toad, according to the description of Albertus Magnus, who describes the most valuable variety of this gem as having "the figure of the reptile imprinted upon it."

The elder poets have, as usual with them, turned into a moralization this fabulous bit of natural history. Lyly, in his "Euphnes," observes, "The foule toad hath a faire stone in his head." Shakespeare has immortalized the superstition in the most effective and beautiful manner, when he declares how—

"Sweet are the uses of adversity,
Which, like the toad, ugly and venomous,
Yet wears a precious jewel in his head."

Superstition did not confine its belief to a few charms; it ranged over more than we can now record. In the Londesborough collection is the massive thumb ring delineated in Fig. 63, having the tooth of some animal as its principal gem, fondly believed by its original owner to have mystic power over his well-being. To "make assurance doubly sure," it is set all round with precious stones, all believed to have magical virtues. Superstition was not confined to the real world of animal life, but ranged over the fabulous natural history, which mixed largely with the true in all men's minds at this credulous era of the world's history, when persons put more faith in false charms for the cure of disease or the prevention of evil than in the power of medicine or the value of proper preventives. The horn of the unicorn, the claw of the griffin, and other relics of equal verity and value, were sought eagerly by those rich enough to procure them, and when obtained were believed to ensure much good fortune to the possessor. A fear of the "evil eye"—that bugbear which still disturbs the happiness of the lower-class Italians, and of the Easterns generally—was carefully provided against. One great preservative was the wearing of a ring with the figure of a cockatrice upon it. This imaginary creature was supposed to be produced from the rarest of all things, a cock's egg, foolishly believed to be laid on certain occasions under magic influence and planetary agencies. Sir Thomas Brown, in his "Vulgar Errors," describes this imaginary creature "with legs, wings, a serpentine and winding tail, and a crest or comb somewhat like a cock."

The Londesborough collection supplies us with a thumb ring (Fig. 64) having two cockatrices cut in high relief upon an agate.

The eye of the living cockatrice was believed to be so deadly as to kill by a look, to which Shakespeare alludes in "Twelfth Night," and again in "Romeo and Juliet"—

"Say thou but I,
And that base vowel I shall poison more
Than the death-darting eye of a cockatrice."

There was, however, a counter action to the danger, for it was also believed that if a person saw the creature before it saw him, then the cockatrice died from the effect of the human eye. To this Dryden alludes—

"Mischiefs are like a cockatrice's eye,
If they first see they kill, if seen they die."

The figure of this bird merely gave security against the evil eye; it had no other effect; and for this purpose various engraved stones



FIG. 64.



FIG. 65.

were used. Thus, Fig. 65, from the same collection, has set in its centre a Gnostic gem, with cabalistic figures, believed able to avert the dreadful glance.

Such stones were, of course, "far sought, dear bought;" and rings believed to possess such covetable power had a high money value. How, then, were the poor, still more ignorant and superstitious, to be aided? Craft came to the aid of faith: demand, as usual, produced supply, and inscription took the place of costly jewels. Rings were fabricated in silver and baser metals having cabalistic words upon them, the names of spirits or of saints. To meet the poorest ring-wearer, they were even cast in lead and sold on the cheapest terms. They were believed to prevent cramp and epilepsy. One in the Londesborough collection is inscribed with the mystic word ANAMZAPTA. In a manuscript of the fourteenth century, in the library at Stockholm, we have this receipt for the falling sickness: "Say the word 'Anamazaptus' in his ear when he is fallen down in that evyll, and also in a woman's ear, 'Anamazapta,' and they shall never more after that feel that evyll."

THE DUNDEE EXHIBITION OF WATCHMAKERS AND JEWELLERS' WORK.

AT the recent exhibition of the Dundee Association of Watchmakers and Jewellers, the watchmakers' competition was divided into two sections, three prizes being offered for competition among journeymen and six among apprentices. The work exhibited consisted chiefly of turning, such as staffs, cylinders and pinions. The following being the order in which the prizes were awarded,—first, Peter Cumming; second, Geo. H. Johnston; third, John Angus, in the section for journeymen. In the work of apprentices, where clock-work, pinions, and such-like predominated, the prizes were awarded as follows—first, C. Harris, Newport; second, P. Forbes, Dundee; third, T. Peebles; fourth, R. Watson; fifth, C. Sword; sixth, J. Boyack. The jewellers' competition was also divided into two, there being two prizes for journeymen and four for apprentices, and contained some very handsome specimens of Scotch jewellery. The first prize was gained by Mr. J. McPherson for a ring set with Scotch pearls, and the second by Mr. J. Kirk, for a Scotch brooch. The successful apprentices were—first, Geo. Anderson, for a coloured gold brooch; second, W. Sellars, for a coloured gold-mounted clan and pebble brooch; third, Alec Mathers, for a clan and Scotch pebble brooch; fourth, Jas. McKay, for sleeve links. Altogether the Exhibition was considered a great success, although there would have been far more competition had longer notice been given.

CLOCK AND WATCHMAKERS' ASYLUM.—The Annual Meeting of the subscribers of this institution took place at the Foresters' Hall, Wilderness Row, on the 10th ult., Mr. Daniel Clarke presiding. John Nelson was elected an inmate of the Asylum, Mr. Christopher Rowlands was re-elected treasurer, and Mr. S. Jackson and Mr. Mercer, who, with Mr. Birchall, retired from the committee, by rotation, were re-elected. Mr. Cole, of the firm of Usher & Cole, Mr. G. J. Moore, and Mr. Harris, were also appointed to serve on the committee. The satisfactory position of the Institution was alluded to by several speakers.

CROWNS.

From the *British Trade Journal*.

CROWNS, ornaments of the head denoting imperial or royal dignity, have a curious history, traceable from a mere fillet or circlet of gold to their adornment with the richest jewels. The radiated appears to be the earliest form of the royal crown with which we are acquainted. It is found upon Persian, Syrian, and Greek coins, and on that of Augustus and other emperors, down to the destruction of the Roman Empire. The strophium, bandelet or fillet, and the laurel wreath were used as crowns in very remote ages. In Constantine's time the fillet of pearls came into use, which the later Byzantine emperors turned into a coronet; it was originally a mere fillet, then a garland, subsequently stuff adorned with pearls. Manuel Palæologus, crowned in 1363, wore a close crown studded with pearls. The trefoil upon the crown is thought to be of Gothic introduction. We find it upon the coins of Clovis and his sons, which has induced antiquaries to call it the *fleur-de-lis*; but the truth is, these trefoils were used on Constantinopolitan crowns before the time of the Franks, and afterwards on those of German princes in no way allied to Charlemagne. Aubrey, the antiquary, was of opinion that the *fleur-de-lis* is really a spear-head adorned with flowers of the lily kind, having the middle part solid. The iron crown of Lombardy takes its name from the narrow iron band within it, which is about three-eighths of an inch broad, and one-tenth of an inch in thickness. This band is traditionally said to have been made out of one of the nails used at the crucifixion, and given to Constantine by his mother, the Empress Helena, the discoverer of the Cross, to protect him in battle. Afterwards it was used at the coronation of the Lombard kings, primarily at that of Agilulfus, at Milan, in the year 591. The outer circlet of the crown is composed of six equal parts of beaten gold, joined together by hinges, and set with large rubies, emeralds, and sapphires, on a ground of blue gold enamel. Within the circlet is the iron band, without a speck of rust, although it has existed for more than 1500 years. When the Emperor Napoleon was crowned king of Italy (at Milan, May 23rd, 1805), he placed the iron crown upon his head with his own hands, exclaiming, "*Dieu me l'a donné, gare à qui la touche*" ("God has given it to me, beware who touches it"); it was the haughty motto attached to it by its ancient owners.

"Luke's iron crown" was a punishment inflicted anciently on regicides, or other criminals, in Hungary, and consisted in placing a crown of iron, heated red-hot, upon the head. The Earl of Athol, who was executed for the murder of James I., King of Scots, was previously to his death crowned with a hot iron. It may be in reference to this that in Shakespeare's "*Richard III.*" Act IV., Scene 1, we read—

"Oh, would to God that the inclusive verge
Of golden metal that must round my brow
Were red-hot steel, to sear me to the brain!"

The Hungarian crown, worn at their accession by the Emperors of Austria, as Kings of Hungary, is the identical one worn by Stephen, 800 years ago. It is of pure gold, and weighs 9 marks, 6 ounces (14 pounds). It is adorned with 53 sapphires, 50 rubies, 1 emerald, and 338 pearls.

With regard to the crown used in our own country, a fillet diadem of pearls appears on several of the Saxon Scattæ. Similar diadems or fillets adorn the heads of many of the Heptarchic kings.

Alfred's crown has two little bells attached; it is said to have been long preserved at Westminster, and may have been that described in the parliamentary inventory taken in 1649. The circle surmounted by three small projections first occurs upon the coins of Athelstan; on some of Edred's coins the projections end in pearls. A radiated cap appears first on a coin of Etheldred II., and the trefoil ornament is upon a few of the coins of Canute. Several varieties of arched cap and crown appears upon the coins of Edward the Confessor. The close or arched crown, which appears on some of the Confessor's coins, is used on all the types of Harold, and was adopted by the earliest Norman kings. On the Confessor's and the Conqueror's coins we see labels appended at each ear: these, as we learn from an anecdote related by William of Malmesbury, in wearing the crown, were fastened by a clasp or button beneath the chin. William I. wore his crown on a cap adorned with points and leaves alternately, each point being tipped with three pearls, while the whole crown was surmounted by a cross. William Rufus discontinued the leaves. On the coins of Stephen and Henry II. the open crown with *fleur-de-lis* appears. Henry III. was crowned with a plain circle of gold, in lieu of the crown, which had been lost, with the other jewels

and baggage of King John, in passing the marshes of Lynn, on the Wash, near Wisbeck. Edward III. wore his crown ornamented with points, *fleur-de-lis* alternately, and *fleur-de-lis* and crosses, as at present. Selden had read that Henry V. was the first of them who wore the arched crowns, and in a window of Ockholt manor house, in Berkshire, 1465, there certainly remained, till within a few years, the arms of Henry VI. and his queen, Margaret of Anjou, in separate coats, both surmounted by the arched barred crown. From Henry VII. downward this arched crown, with the globe and cross, has been continued.

"St. Edward's crown" was made in imitation of the ancient crown said to have been worn by the Confessor, and kept in Westminster Abbey till the beginning of the civil war in England, when with the rest of the regalia, it was seized and sold. A new crown was prepared for Charles II.

A magnificent crown was made for George IV. with the jewels of the old crown and jewels borrowed of Rundell & Bridge, the crown jewellers. This crown was 15 inches in height; the arches were not flat as in the former crown, but rose almost to a point, and were surmounted by an orb of brilliants, upon which was placed a Maltese cross of brilliants, with three fine pearls at its extremities. The arches were wreathed and fringed with diamonds, and four Maltese crosses of brilliants surmounted the crown, with four large diamond flowers intervening. On the centre of the back cross was the ancient ruby which was worn at Cressy and Agincourt by the Black Prince and Henry V.; while the centre of the front cross was adorned with a unique sapphire, more than 2 inches long and 1 inch broad; and a band of large diamonds, emeralds, sapphires, and rubies completed a magnificent diadem. It was estimated to be worth 150,000*l.*, and the expenses upon it, preparatory to the coronation of George IV., amounted to 50,000*l.* or 60,000*l.* over and above the addition of the inestimable sapphire.

The imperial State crown was made by Messrs. Rundell & Bridge, in the year 1838, with jewels taken from old crowns, and others furnished by command of Her Majesty, and is thus described by Professor Tennent:—"It consists of diamonds, pearls, rubies, sapphires, and emeralds, set in silver and gold: it has a crimson velvet cap with ermine border, and is lined with white silk. Its gross weight is 39 oz. 5 dwt. Troy. The lower part of the band, above the ermine border, consists of a row of 129 pearls, and the upper part of the band of a row of 112 pearls, between which, in front of the crown, is a large sapphire (partly drilled), purchased for the crown by George the Fourth. At the back is a sapphire of smaller size, and six other sapphires (three on each side), between which are eight emeralds. Above and below the seven sapphires are 14 diamonds, and around the eight emeralds 128 diamonds. Between the emeralds and the sapphires are 16 trefoil ornaments, containing 160 diamonds. Above the band are eight sapphires, surmounted by eight diamonds, between which are eight festoons consisting of 148 diamonds. In the front of the crown, and in the centre of a diamond Maltese cross, is the famous ruby said to have been given to Edward, Prince of Wales, son of Edward the Third, called the Black Prince, by Don Pedro, King of Castile, after the battle of Najera, near Vittoria, A.D. 1367. This ruby was worn in the helmet of Henry the Fifth at the battle of Agincourt, A.D. 1415. It is pierced quite through, after the Eastern custom, the upper part of the piercing being filled up by a small ruby. Around this ruby, in order to form the cross, are 75 brilliant diamonds. Three other Maltese crosses, forming the two sides and back of the crown, have emerald centres, and contain respectively 132, 124, and 130 brilliant diamonds. Between the four Maltese crosses are four ornaments in the form of the French *fleur-de-lis*, with four rubies in the centres, and surrounded by rose diamonds, containing respectively 85, 86, and 87 rose diamonds. From the Maltese crosses issue four imperial arches composed of oak leaves and acorns; the leaves contain 728 rose, table, and brilliant diamonds; 32 pearls from the acorns, set in cups containing 54 rose diamonds and one table diamond. The total number of diamonds in the arches and acorns is 108 brilliant, 116 table, and 559 rose diamonds. From the upper part of the arches are suspended four large pendent pear-shaped pearls, with rose diamond caps, containing 12 rose diamonds, and stems containing 24 very small rose diamonds. Above the arch stands the mound, containing in the lower hemisphere 304 brilliants, and in the upper 244 brilliants; the zone and arc being composed of 33 rose diamonds. The cross on the summit has a rose-cut sapphire in the centre, surrounded by four large brilliants, and 108 smaller brilliants."

SUMMARY OF JEWELS COMPRISED IN THE CROWN.

1 large ruby, irregularly polished; 1 large broad-spread sapphire; 16 sapphires; 11 emeralds; 4 rubies; 1363 brilliant diamonds;

1273 rose diamonds; 147 table diamonds; 4 drop-shaped pearls; 273 pearls.

Unlike most other princely crowns in Europe, all the jewels in the British crown are really precious stones, whereas in other State crowns valuable stones have been replaced by imitations. Odd mischances befall crowns. At the close of the late Abyssinian war the true crown of King Theodore was bought at the capture of Magdala, from a common soldier, by a Prussian officer attached to the expedition, and was by him presented to his sovereign. His Majesty had his attention drawn to Lord Napier's order, forbidding the sale of articles taken by the army, and the crown was forwarded to the British Government.

SOME FACTS CONCERNING THE LIFE, TRIALS, AND MISFORTUNES OF HENRY SULLY, THE WATCHMAKER.

(From the *Mechanic*.)

THE materials at command from which to form the biography of Henry Sully are very few and scarce, inasmuch as there is no notice of him in any of the leading English cyclopædias, which is somewhat surprising, considering that he was a prominent member of the horological profession in most of the Continental cities. Beyond a tract written by a lover of his genius the only means at hand we gather from two distinguished and diligent workers of the horological art, who obtained what little is known of him from occasional remarks in the writings of foreign artists. Henry Sully was an Englishman, born in 1680, and apprenticed at an early age to a celebrated watchmaker of London, named Grettton, under whom he made great progress, he being most assiduous in his attempts to improve timekeepers, which soon gained for him some reputation among those connected with the supporters of his employer; and, on completing his apprenticeship, he immediately set to work to construct a watch which might be the means of discovering the longitude at sea. Having, in the year 1703, shown his plans to Sir Isaac Newton, and, receiving great encouragement from him, so increased his desire to attain his object by means of a timekeeper that he laboured incessantly to produce such to perfection; but his object requiring much time—which was money—was ill-suited to the condition of a needy watchmaker—for such he was; and before he could complete his instrument circumstances compelled him to leave his country. He went to Holland in 1708, where he remained until 1715, from whence, after having become acquainted with the French and Dutch languages, he went to Vienna, where he acquired German. His genius and conversation obtained for him there the notice of Prince Eugene. The Duke d'Arenberg and Count de Bonneval induced him to accompany them to the army on the Rhine. There he had the charge of the watches, and several German noblemen became his patrons and friends; and on peace being restored Sully returned to Paris with the Duke d'Arenberg, who gave him apartments in the Hotel d'Ausbac, with a pension of 600 livres. Soon after his arrival in Paris he was introduced to Julien Le Roy, who writes of him: "In our first conversation we disputed the merits of French and English watches, but I was on the weaker side, our watches at that time being inferior to those of London." Shortly afterwards, when the Duke d'Arenberg went to reside at the Cloître de St. Germain l'Auxerrois, Sully followed him, and there married.

Though a foreigner, Sully applied for the post of "Maître Horloger," but the Parisian watchmakers, alarmed at his reputation and supporters, united in opposing him in his desire to obtain such an appointment. His friends, however, obtained for him a donation from the Regent of 1500 livres, which Law, of Lauriston, the noted Scotch speculator, was charged to remit to him under the authority of the Court of Versailles. Law, who was a clever man, went to see him, and, having discovered Sully's talents, considered him to be a person highly qualified, and the best adapted person to be engaged in establishing a manufactory for clocks and watches, with a view to the benefit of France. He soon afterwards communicated this design to Sully, who, at his request, went twice to London to engage workmen for the purpose; and, having engaged sixty, they with their families were located at Versailles. The manufactory thus formed existed about two years, and Sully was the director. But expenses resulted, the workmen had to be paid, expensive tools were supplied by Sully in order to produce work of a required standard. But as Law was thoroughly ignorant of the practical part of the business he could not understand why so small a profit resulted, and, therefore, began to murmur. Nevertheless, these two years formed the most prosperous period of Sully's life. Handsome apartments, steward,

servants, workmen to carry out his ideas, with ample funds, of which he had the management, everything for a time equalled his wishes; but this enviable state was of short duration. The expenses of the manufactory were necessarily great, and Law, suspecting Sully of extravagance, displaced him. Spirit-broken at this reverse, Sully returned to Paris, took furnished apartments, fell dangerously ill, and sorrow retarded his recovery. But Law relented and changed his conduct towards Sully, through which, fortunately, a nobleman became acquainted with him, felt much for the disagreeable situation in which Sully was placed, and sent him, as a present, some shares in the public funds—value 12,000 livres—which enabled him to feel again in easy circumstances, and at once turned his attention to the means of bringing horology to perfection. For this purpose he proposed, under the protection of the Duke de Noailles, to establish a manufactory at St. Germain. In this he was so well assisted by the duke as to be enabled to take a commodious house, and procure a number of workmen from Paris, London, and Amsterdam, who were employed solely under his direction. All his energy was exerted in exciting his men to surpass those of Versailles; thus for some time the two manufactories were endeavouring to emulate each other. But the times changed. Law was obliged to leave France in consequence of the scarcity of money; the manufactories suffered much, especially that of Sully. His small capital soon became exhausted by paying clever workmen to produce difficult pieces of work, for which, when completed, there were no purchasers, and consequently the scheme was abandoned. The English Government at length became aware of the injury likely to befall this country from the loss of clever artisans, and granted 3000*l.* to the workmen employed in the French manufactories, to enable them to return and again settle in London. This grant, together with the liberal offers of several noblemen, induced Sully to return to his native country with his workmen. After continued struggles he found himself again dependent upon his personal labour, which was insufficient to maintain himself. A leaning to the scenes of his former happiness determined him to return to Versailles, which enabled him to stem the tide of human requirements, and by degrees his position improved, and being clever, his affairs assumed a favourable aspect. Having procured a few skilful workmen he again indulged in his favourite pursuit, and produced a chronometer, the escapement of which was his own invention. For some time it went well, and its exhibition produced orders from several ambassadors who wished to present them to their various sovereigns. These orders, with others, were too much for our poor countryman's finances; he was, therefore, obliged to request those who desired them to advance cash when giving the order. But when they were completed he found that they were not quite to his mind. His various attempts to correct the faults occupied much time; his subscribers became tired of waiting, and demanded their money back.

During his attempts to improve those timekeepers his debts became excessive, and to add to his misfortunes his most valuable tools were sold with other property during his absence, to pay arrears of wages due to his workmen; he was thus reduced to poverty. He again returned to Paris, and grief once more brought on a long illness, and during his convalescence he joined the Society of Arts, which formerly met at the Louvre. The last time he attended that society he read a translation of a letter he had received from the celebrated Gregory, on the utility of mathematics. Towards the end of the same week, having heard of an individual who had something new in horology to show to the society, he took the address incorrectly, and in the search overheard himself, and died four days after of inflammation of the chest in October, 1728. He was buried with funeral honours opposite the door of the sanctuary of St. Sulpice. His last days were employed in endeavouring to make chronometers useful to navigation, generously sacrificing his own interests in an attempt which, if successful, he felt sure would benefit mankind and be the means of preserving innumerable lives.

THE RICHEST SILVER MINE IN THE WORLD.—The Consolidated Virginia mine is the most profitable in the world. During 1875 it yielded 169,307 tons of ore worth 98 dollars per ton. Since December last about 600 tons have been hoisted daily. As soon, however, as the connections with another shaft are complete it is computed that this hoisting capacity will be increased to 2000 tons per day. The superintendent of the mine says that, even under this great drain, there is enough ore in sight to last for many years. The almost fabulous amount of wealth which still lies buried, and which the drillers of the miners have not yet exposed, cannot be conjectured.—*Scientific American*.

MESSRS. ELKINGTON'S WORKS OF ART AT THE PHILADELPHIA EXHIBITION.

AMONG the leading and most prominent exhibitors at the Philadelphia Exhibition will be Messrs. ELKINGTON & Co., whose contribution will be of an aggregate value of about 100,000*l*. They are having assigned to them a place of honour in the centre of the English department, where their show cases will occupy a fourth of the entire space beneath the tower; and the collection will not only be one of the largest, but probably the finest and most important of the kind ever exhibited, surpassing even the magnificent display which was made by the same firm at the Vienna Exhibition, and some of the plate which they will show to the Americans is pronounced by the most experienced judges to be the finest ever produced. The articles form a deeply interesting exhibition of themselves, and include two silver dessert services, each of the value of two thousand guineas, though one of them consists only of three pieces. We may state that, large as will be Messrs. ELKINGTON'S contribution to the Exhibition, it will be confined entirely to what are essentially works of the highest art, for the firm are not troubling themselves to send out any of the ordinary domestic articles of silver and electro-plate, such as dishes, forks, spoons, &c. They prefer rather to invite the attention of the world to specimens of highly-decorative work, all of which have been produced at their own manufactory, most of them being designed and all executed under the personal superintendence of their chief artistes, M. Morel-Ladeuil and M. Willms. The articles selected for exhibition consist, for the most part, of decorative dessert services, vases, shields, mirror frames, plaques, and tazzi.

The collection may be described as illustrating the three principal classes of repoussé work in silver, enriched by gilding and enamelling; repoussé work in iron, decorated by inlaid and damascened patterns in gold and silver; and *champlevé* and *cloisonnée* enamels. In all of these departments considerable progress has been made since the Vienna Exhibition; but in none of them is it more noticeable than in the *cloisonnée* enamels, which far surpass the Chinese or the modern Japanese examples of the art, and even approach very nearly to the exquisite beauty of the old Japanese. It forms an imperishable picture, capable of resisting everything but intense heat and great violence, and of a material which lends itself with especial readiness to rich and harmonious colouring, while the delicate bright metallic lines bordering the *cloisons* form a pleasing contrast to the comparative dulness of the opaque glass. The perfection to which Messrs. ELKINGTON & Co. have now brought the art has only been reached by numerous experiments, and many and costly failures; but the work which is now produced leaves little to be desired. It may be mentioned as a special feature of enamel work that it does not admit of being copied or reproduced by any other method, and hence that it can never lose its rare and costly character. The *champlevé* enamel, which is chiefly used for the decorative enrichment of metal work, is of a more simple kind.

The repoussé work in iron is of especial interest; and, although extremely costly originally, it differs from enamel in this—that an imitation of it can be produced at a moderate price. The artist commences with a dish or other article of fine wrought iron, and on the upper surface of this he engraves the outline of a pattern. The dish is then reversed, and is beaten at the back by punches and hammers until the traced pattern is rendered concave at the back, and correspondingly convex on the upper surface. The prominences thus produced are finished in detail by chasing, and when this is done the dish is ready to receive further decoration by inlaying, or by damascening. For the inlaying, grooves corresponding to the lines of a traced pattern are cut in the iron, and these grooves are filled by gold or silver wire, which is driven into them by punches, and then finished upon the surface as may be required. Damascening is a slightly different process, which somewhat resembles embroidery, and leaves the hand of the artist free to follow his fancy, and to produce any flowing outlines that he may desire. A very exquisite specimen of this work is an oval mirror frame, damascened with birds and arabesques. The arabesques are simply burnished, but the birds are sculptured until the outline of almost every feather may be traced. Messrs. ELKINGTON exhibit some copies of this kind of work, of which their well-known "Milton shield," from the original at South Kensington, is an example; but they only copy originals which are in museums, or otherwise public property; they include the copyright of an original repoussé work in the price charged to any private purchaser. The most remarkable examples sent to America are a dessert service, a tazza, and some dishes or plaques. The dessert service is in iron repoussé, inlaid with gold and silver, relieved by exquisitely-chased panels of oxidized silver, and supported on crystal pillars, delicately engraved

with incised and gilt ornamentation. The tazza is in repoussé silver, with a border of iron damascened and incrustated with gold, and the principal subject (which has occupied M. Morel-Ladeuil, the artist of the Helicon vase and of the Milton shield, two years in execution) is a Pompeiian lady at her toilet, attended by her slaves. The relief is so high that the figures seem almost as if undercut, and the work is regarded altogether as one of the finest specimens ever executed. A smaller plaque, by the same artist, is an allegorical group representing Charity, and another is a farmyard composition, in which a child is frightened by some clamorous poultry.

The decorative dinner and dessert services are of various styles—Egyptian, Grecian, Pompeiian, Romano-Greek, and Renaissance. They are made either in massive silver or in copper electro-plated, in either case relieved by gilding; and two complete services, consisting of centre-pieces, plateaux, candelabra, and fruit stands, are richly decorated with *champlevé* enamelling, and panelled with gold.

The *cloisonnée* enamels, which are included in this collection, are all, we need scarcely say, exceedingly fine. M. Morel-Ladeuil's exquisite tazza, the magnificent dessert services, and the Venetian mirror designed by M. Willms, with its very beautiful framework of solid silver, inlaid with gold, are beyond description. In the production of these splendid works Messrs. ELKINGTON must stand unrivalled, and they will even add to their great reputation by the valuable collection of articles sent to the American Exhibition, and which are of a most elaborate description.

CORRESPONDENCE.

THE HATTON GARDEN JEWELLERY ROBBERY.

To the Editor of the WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—I observe in your able journal for the present month, an account of the above robbery, and had you not ventured upon the difficult task of explaining the *modus operandi* of the affair, I should not have trespassed upon your space for reply. The following letters, which I addressed to the daily journals, will show you my own opinion of the matter:—

"Being the manufacturer of the two safes in use by Messrs. Williams, I beg to state that from an examination of the safes themselves, and the premises in which they are situate, I have no hesitation in arriving at the conclusion that both the locks of Messrs. Chubb and Son on the office door, and my own locks on the safes, were unlocked exactly as they were designed to be, *i.e.*, by their own keys, or by others deliberately made from them. I am afraid that the true explanation of robberies of this character must be sought rather in breaches of trust or culpable negligence than in the unaided efforts of 'Carrotty Fred' and his clique. Messrs. Williams are themselves satisfied that an improper use has been made of their several keys, but how, when, or by whom they are unable to say. They have requested me to change the combination of the locks, so that the false keys will not fit, which I have done. Bankers, diamond merchants, and others having charge of large amounts of value would do well to have their locks changed occasionally, so as to lessen the risk of an improper use of their keys."

Since writing the above letter I have been surprised to learn that it is a common practice in some houses in the trade for a trustworthy party to have charge of one of the keys of a safe, and for the duplicate to be kept in the drawer of another safe of inferior make, to which safe access is open to the clerks. I am quite sure this state of things arises from want of consideration. The best place for the duplicate keys is undoubtedly in a small sealed box lodged with the firm's bankers, with instructions not to deliver it up except to the principal, or to his written order. I some years ago designed for bank use a small steel key box for the pocket, in which to send the leading keys of a bank to a place of secrecy and safety off the premises. This box is made out of a short length of round cast steel, bored out, one end being left solid, and having a small plug lock in the other. The leading keys which it is desired to send away from the bank, are dropped into the box and locked up by the manager, who retains the small key. The key box is then carried away in the pocket of one of the bank assistants, who, however, can gain no information as to its contents. I would suggest that the duplicate keys of all safes containing large amounts of value should be locked up in key boxes—sealed and lodged away from the premises in which the safes are situate. I prefer to deposit them with bankers for safe custody, and to ensure proper registry, so that the fact of the duplicates being called for will at once be made known, and breaches of trust be rendered more difficult. While I feel bound to state the utter impossibility of the keys having been "made from moulds secured at some moment when Mr. Williams may have laid his keys down in his office," I quite agree with your caution.

I remain, yours truly,

SAMUEL CHATWOOD,

Bankers' Safe and Lock Engineer.

120, Cannon-street, London, E.C.,

April 29th, 1876.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

1455. RICHARD WERDERMANN, of Princes Street, in the county of Surrey, Civil Engineer, for an invention of "Improvements relating to the extraction of gold, silver, and other metals from ores and other substances, and in apparatus therefor, which apparatus is applicable for other purposes."—Dated 5th April, 1876.
1528. WILLIAM HENRY ALFORD, of Ventnor, Isle of Wight, in the county of Hants, for an invention of "Improvements applicable to finger rings, bracelets, and other similar articles."—Dated 11th April, 1876.
1529. To JOHN COMPTON WEEKS JEFFERYS, 14, Tottenham Court Road, in the county of Middlesex, Manufacturing Jeweller, for an invention of "Improvements in scarf-rings and other like dress fastenings and ornaments."—Dated 11th April, 1876.
1720. GUSTAV WILHELM SCHUMACHER, of Portland, in the county of Cumberland and state of Maine, one of the United States of America, Manufacturer, for an invention of "Improvements in thermometers."—(Complete Specification.)—Dated 22nd April, 1876.
1830. ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, for an invention of "A combined calendar and time-piece with perpetual automatic adjuster attachment for the irregular number of days in the different months."—A communication to him from abroad by Miner Hamlin Paddock, of East Clarkson, Monroe county, State of New York, United States of America.—Dated 1st May, 1876.

Grants of Provisional Protection for Six Months.

956. To THOMAS WILLIAM GREAVES, Jeweller, of Birmingham, in the county of Warwick, for the invention of "Improvements in ornamenting solitaires and other articles of jewellery with pressed glass, and which said improvements are also applicable for other useful purposes."
958. To WILLIAM BAXTER, of Birmingham, in the county of Warwick, and THOMAS GREAVES, also of Birmingham aforesaid, for the invention of "Certain improvements in studs or solitaires."
1178. To HIPPOLYTE COLLOT, of 55, Lamb's Conduit Street, in the county of Middlesex, Jeweller, for the invention of "Certain improvements in solitaires."
1272. To HENRY WALKER, of Birmingham, in the county of Warwick, Gun Manufacturer, for the invention of "Improvements in fastenings for solitaires, sleeve links, collar and other studs, gloves, bags, and other articles."
1340. To JOHN THORNTON BINTLEY, of Beckenham, in the county of Kent, Civil Engineer, for the invention of "Improvements in cases for watches and clocks."
1445. To RICHARD WERDERMANN, of Princes Street, in the county of Surrey, Civil Engineer, for the invention of "Improvements relating to the extraction of gold, silver, and other metals from ores and other substances, and in apparatus therefor, which apparatus is applicable for other purposes."
4434. JAMES WEBSTER, of Clerkenwell, in the county of Middlesex, Thermometer Maker, "Improvements in clinical thermometers."
4445. EDWARD THOMAS HUGHES, of the firm of Hughes and Son, Patent Agents, 123 Chancery Lane, London, "Improvements in treating certain metallic alloys for imparting resonance thereto."—A communication to him from abroad, by Benjamin Silliman, of New Haven, Connecticut, Chemist, and HORACE CORNWALL WILCOX, of West Meriden, Connecticut, Manufacturer of Britannia Ware, both in the United States of America.
4498. JUAN NEPOMUCENO ADORNO, of Harley Street, Cavendish Square, in the county of Middlesex, gentleman, "Improvements in watches and clocks."
1720. GUSTAV WILHELM SCHUMACHER, of Portland, in the county of Cumberland, and state of Maine, one of the United States of America, Manufacturer, "Improvements in Thermometers."

Inventions Protected for six months by deposit of a Complete Specification.

3662. WILLIAM JEPHCOTT, of Birmingham, in the county of Warwick, Watch Maker, for an invention of "Improvements in the cases of watches, clocks, timepieces, lockets and other similar articles."—Dated 21st October, 1875.

Patents which have become Void.

1114. JOHN GOETTLER, of 45, Spencer, Street, Northampton Square, Clerkenwell, in the county of Middlesex, for an invention of "Improvements in keyless watches."—A communication to him from abroad by Olivier Courvoisier, of 1, Rue de Seyon, Neuchâtel, in the republic of Switzerland.—Dated 26th March, 1873.

1295. WILLIAM CARRON, of Birmingham, in the county of Warwick, Machinist, for an invention of "Improvements in fastenings for brooches, sleeve links, and other articles of jewellery, ornament and dress."—Dated 8th April, 1873.

Patents granted in British Colonies and Dependencies.

5562. ANSEL S., BUCKELEW, of Jersey, N.J., U.S., for "A watch-case spring." (Resort de boitier de montre)—5 years—Dated 10 January, 1876.
5575. BENJAMIN SILLIMAN, of New Haven, and HORACE C. WILCOX, of West Meriden, Ct., U.S., for "A process for imparting resonance to metallic alloys." (Procédé pour donner de le sonorité aux alliages métalliques.)—15 years.—Dated 10th January, 1876.

Patents Granted in Foreign States.

FRANCE.

- 109,416. FAUVEL, for "Anti-neuralgic and electro-galvanic spectacles and eye-glasses."—Dated 4th September, 1875.
- 109,429. POTTER, for "Improvements in the manufacture of watches and chronometers."—Dated 1st September, 1875.
- 109,649. JACOT-BURMANN, for "Ladies' watches with a pendant remontoir and anchor escapement."—Dated 18th September, 1875.
- 109,756. MATHONNET, of Marseilles, for "A combined watch and clock."—Dated 2nd October, 1875.

Certificate of Addition.

- 100,708. DAUBRIVE and CLERGET, for "Improvements in barometers."—Dated 15th September, 1875.

BELGIUM.

- 39,044. F. DOMS and G. VANTICHELIN, of Louvain, for "Improvements in church clocks, and means of making them go at all temperatures."—Dated 25th February, 1876.
- 39,134. C. VRANCKX, of Tesselenderloo-Hasselt, for "A stop escapement for clocks."—Dated 18th March, 1876.

AUSTRIA.

51. J. JACOBOWITS, of Grosswardein, for "A simplified repetition pendulum clock."—1 year.—(Secret.)—Dated 6th November, 1875.
79. C. A. MAYRHOFER and J. REICHARDT, of Vienna, for "Electro-pneumatic clocks."—1 year.—(Secret.)—Dated 14th November, 1875.

UNITED STATES.

- 172,827. ISAAC N. HOPKINS, of Lockport, assignor of one-half of his right to H. W. Preston, of Albion, N.Y. for "Watch-case springs."—Application filed 9th November, 1875.—*Brief*.—"An auxiliary spring adjustable on the catch and lifting-spring, and provided with a nib to be fitted in the hole in the case ordinarily occupied by the screw."
- 172,932. CHAUNCEY C. PARKER, of Brooklyn, N.Y., for "Eyeglasses."—Application filed 13th January, 1876.
- 173,011. GEORGE HUNTER and CHARLES S. MOSELEY, of Elgin, Ill., assignors of one-tenth of their right to the Elgin National Watch Company, of the same place, for "Cannon-pinions for watches."—Application filed 12th January, 1876.—*Brief*.—"A tongue cut in the side of the pinion-barrel is bent inwardly against a tapering staff, to prevent the pinion from rising on the staff."
- 173,036. ANTON MEYER, of Stuttgart, Germany, for "Watchmen's time-detectors."—Application filed 4th January, 1876.—*Brief*.—"A continuous strip of paper is supplied from a reel to the drum operated by the clock-movement. On its way to the drum the strip passes over a support placed opposite a series of marking devices operated by suitable keys. An index on the drum marks the time on a stationary dial on the case."
- 173,053. A. PHILIPPE, of Geneva, Switzerland, for "Stem-winding watches."—Application filed 7th January, 1876.
- 173,072. R. J. SHEEHY, of Boston, Mass., for "Electric-clocks."—Application filed 16th November, 1875.—*Brief*.—"To sound the bell, shunts the current around a resistance, through which it normally passes, thereby increasing the attractive force of an electro-magnet sufficiently to operate an auxiliary armature, whose lever carries the bell-hammer."
8937. GEORGE W. GILL, of Philadelphia, Pa., for "A locket."—Application filed 30th December, 1875.—Term of patent $3\frac{1}{2}$ years.
8944. CHARLES T. SLOAN, of New York, N.Y., for "Breast-pins, &c."—Application filed 13th December, 1875.—Term of patent $3\frac{1}{2}$ years.
- 173,139. H. A. SEYMOUR, of Bristol, Conn., for "Clockbells."—Application filed 3rd January, 1876.

THE Watchmaker, Jeweller, and Silversmith,

A MONTHLY TRADE JOURNAL,

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades; published at 34, HATTON GARDEN, LONDON, E.C.

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Cheques and Post-office Orders to be made payable to A. VICTOR, at Holborn Viaduct Post Office, W.

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

BRECKNELL JOB, Lower Union-street, Torquay, jeweller. Apr. 5. Hooper and Wollen, solicitors, Torquay.

CAPPELL FRANCIS, Bell Barn-road, Birmingham, watch material dealer. Apr. 5. A. Pointon, solicitor, Temple-road West, Birmingham.

CARTER ROBERT, sen., Tottenham Court-road, jeweller. Apr. 22. Hope, jun., 35 Great James-street, Bedford. H. E. Rice, solicitor.

COLLINS JOSEPH, Alfred-street, Warstone-lane, Birmingham, silversmith. Apr. 22. J. M. Green, solicitor, 43 Waterloo-street, Birmingham.

HARRIS FREDERICK H. B., 27 Claremont-square, goldsmith and jeweller. Apr. 19. Spyers & Sons, solicitors, 1 Winchester House, Old Broad-street.

IMPEY BEDFORD, Mary-street and Cannon-street, Birmingham, gilt jeweller and publisher. Apr. 20. W. Morgan, solicitor, 37 Waterloo-street, Birmingham.

LEVENE WOLFF, 4 Caroline-street, and 47 Adam-street, Cardiff, jeweller and pawnbroker. Apr. 25. M. Morgan, solicitor, Cardiff.

MICHAEL JAMES, trading as J. MICHAEL & Co., Soho-hill, Handsworth, jewellery factor. Apr. 7. Crowther Davies, solicitor, 25 Bennett's-hill, Birmingham.

MILES JAMES and FREDERICK SPON, 33 Aldersgate-street, jewellers. Apr. 5. Lumley and Lumley, solicitors, 15 Old Jewry-chambers, and 22 Conduit-street, Regent-street.

MOXON THOMAS, Great Hampton-row, Birmingham, jeweller. Apr. 24. Crowther Davies, solicitor, 25 Bennett's-hill, Birmingham.

MYERS BARNETT, 1 Peatrice-crescent, Birmingham, jeweller. Apr. 22. C. B. Hodgson, solicitor, 13, Waterloo-street, Birmingham.

SHAW JAMES, Cheapside, Leicester, jeweller. Apr. 12. Fowler, Smith & Warwick, solicitors, Leicester.

VEALE THOMAS JAMES, Onslow-road, Newtown, Southampton, watchmaker and jeweller. Apr. 7. Coxwell, Bassett & Stanton, solicitors, Southampton.

WILLIAMS JOHN, trading as JOHN ROBERT WILLIAMS & SON, Hatton Garden, London, jewellers. Inns of Court Hotel, 269 High Holborn. Lewis and Lewis, solicitors, 10 Ely Place.

Notices of Dividends.

The Dividends are payable at the offices of the respective Assignees or Trustees named at the end of each notice. Bkt., Insol., Liq., or Asg., following the name, indicates whether the dividend is under a Bankruptcy, Insolvency, Liquidation, or Assignment.

BARNARD ASHER (Bkt.), Bedford Circus, Exeter, dealer in jewellery. Div. 1s. 6d.; any day; Mr. Fewing, Queen-street, Exeter.

EDWARD JOSEPH, Aldersgate-street, City, jeweller. $\frac{1}{2}$ ths 1d.; Wednesday next and three subsequent Wednesdays; Mr. Paget, 34 Lincoln's-Inn-Fields.

PHILLIPSON WILLIAM (Bkt.), Richmond-row, Liverpool, jeweller. 2nd and final div. 3s.; any Wednesday between 11 and 2; H. Bolland, 10, South John-street, Liverpool.

Discharges Granted and Bankruptcies Annulled.

SARL ABRAHAM, 45, Cornhill, Silversmith. (The property has been realized and has not yielded sufficient to pay the expenses of the bankruptcy) Bankruptcy closed Mar. 23.

Dissolutions of Partnership.

ALAND & FERON, 18 Great Sutton-street, Clerkenwell, water-gilders. Mar. 31. Debts by John Aland.

FAULKNER & FAIRALL, Ryde, jewellers. Mar. 24. Debts by W. I. Fairall.

FEAR & DAVIS, 57 Northampton-street, Birmingham, jewellers. Oct. 2. Debts by Edwin S. Fear.

GREEN CHARLES & SON, Augusta-street, Birmingham, jewellers. Mar. 31. Debts by Charles Green.

HAVELL & COX, 4 Belsize Park-terrace, Hampstead, jewellers. Feb. 19.

HORTON & MAYER, 3 Frith-street, Soho, working jewellers. Dec. 31. Debts by Alfred E. Horton.

JONES & WALTON, Hockley, Birmingham, jewellers. Dec. 31. Debts by Thomas W. Jones.

MAGSON & TURNER, Ryley-street, Coventry, watch springer and engine turner. Jan. 17.

MYERS W. & G., Richard-street, Birmingham, jewellers and factors. Dec. 31. Debts by George Myers.

NEEDHAM, OWEN & Co., Sheffield, electro plate manufacturers. Jan. 19.

OGDEN, SON, & HITCHIN, 28 Blackfriars-street, Manchester, art metal workers. Mar. 15. Debts by James Ogden.

OSWIN, BOLZANI & Co., 7 Thomas-street, Shude-hill, Manchester, jewellers. Apr. 7. Debts by William H. Oswin.

SILVERSTON I. & A., Summer-hill, Birmingham, jewellers. Jan. 28. Debts by Abraham Silverston.

TEBBITT & SON, 6 Foster-lane, jewellers and importers. Mar. 4. Debts by Alfred T. Tebbitt.

TICK & GODFREY, 12, St. James-street, Clerkenwell, jewellers. Jan. 1.

TURPIN BROS., Banner-street, St. Lukes, watch manufacturers. Feb. 4.

Sequestrations.

MUIRHEAD LEWIS P. & Co., Glasgow, goldsmiths, &c., and LEWIS POTTER MUIRHEAD, sole partner of said firm, as such, and as an individual. Apr. 18, with protection. Tr. and Com. Faculty Hall, Glasgow, Apr. 28 at 2. Claims by Aug. 18. Agent, William Officer, S.S.C.

Dividends under Sequestrations.

FRASER WILLIAM, High-street, Inverness, jeweller. Equalizing and 2nd, and final, Thomson, Johnston & Jackson's, 70 George-square, Glasgow, on and after May 1.

Scotch Sequestrations.

BARNETT JOHN, Argyle Arcade, Glasgow. Apr. 26, with protection claim by Aug. 26. Agent, James W. Knox, Glasgow.

Trust Deeds Granted.

MCRAE JOHN, Pollockshaws, watchmaker and jeweller. Claims with John Wight, 150 Hope street, Glasgow, by May 19.

Last Days for Lodging Claims.

JAVAN HENRY W. P. (Bkt.), 18 Lever-street, Goswell-road, jeweller. Claims by May 15 to T. Leighton, 21 Snow-hill, Birmingham.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 9d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 6½d. to 4s. 8d. (variable).

IMPROVEMENT IN THE MANUFACTURE OF PENCIL CASES.—Messrs. E. Wolff & Sons have invented and patented a great improvement in an adjustable metal case for holding cedar pencils. It is about four inches long and made of aluminum or other metals, but instead of being fitted with "leads" a cedar pencil, the entire length of the case, is inserted. A telescopic slide propels the pencil when wanted for use, and this is so compact in its arrangement that the whole of the pencil can be used. The advantages are an economical use of pencils, the avoidance of the trouble of fitting leads (often difficult to procure of the right size), and the point is not rickety, but always firm. A box containing four pencils, price 6d., is sold with the case. Prices of cases are: Aluminum (superior quality) 3s. 6d.; nickel plated (equal in wear to silver), 2s. 6d.; electro-plated silver 1s. 6d.; white metal 1s. The article will doubtless be in great demand.

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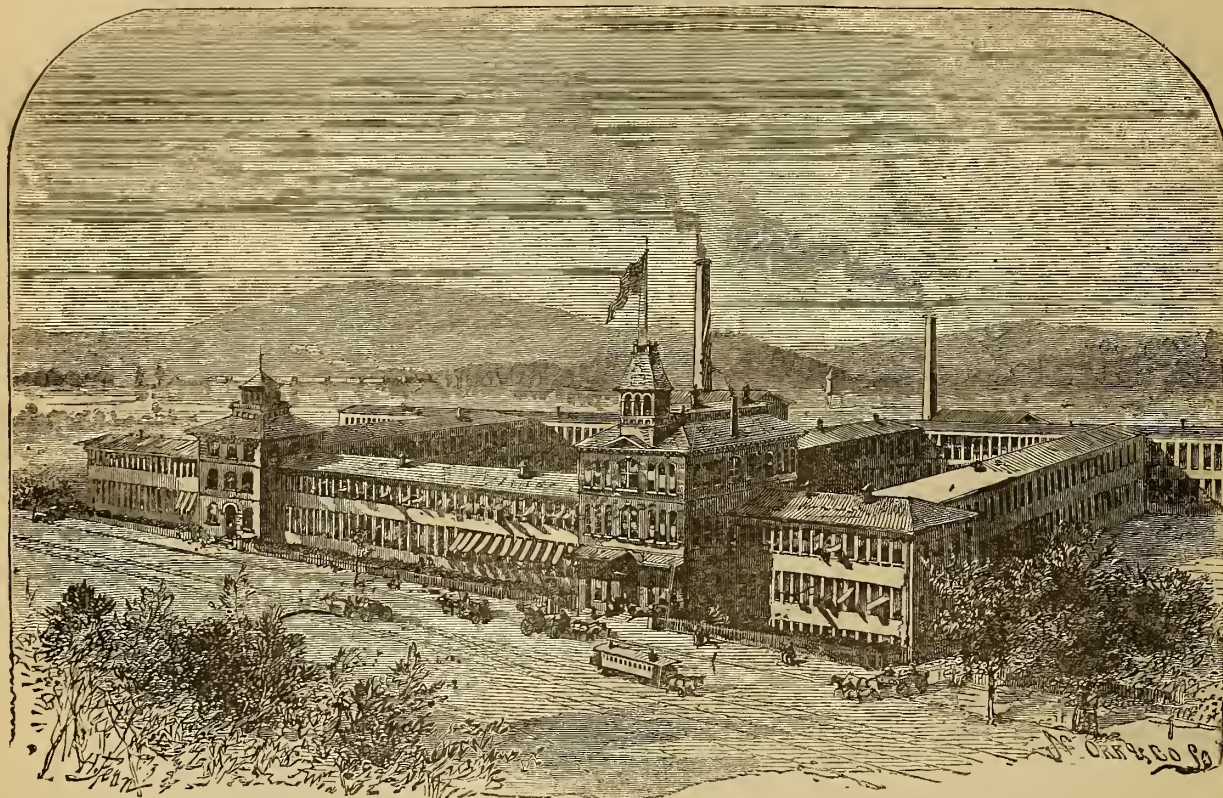
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"By hand-labour it is impossible for this country to compete with Switzerland in the Watch Trade; and, if we would hold our own in Europe in this branch of industry, we must follow the example of the Americans, who have successfully used machinery in the manufacture of Watches."—*Extract from the "Times" of December 18, 1868.*



"The section which conspicuously brings out the enormous strength of America as a producing power is that of tools; and still more especially the vast array of machine tools for metal, which are the parents of all other machines—more than 100 exhibitors have each a group that commands the admiration of all who take the trouble to examine them in detail. These tools are for all purposes: small arms, sewing machines, clocks, watches, and all branches of machine making and engineering, and almost all are finished in a style superior to that of any former exhibition. Probably the most exquisite set of machine tools ever made is that exhibited by the American Watch Company, of Massachusetts. No mere words can convey an idea of their high standard of excellence; they must be felt and handled. What the Whitworth gauges are to true circles, these lathes and tools are to all forms required in the manufacture of watches. Add to this, great convenience in arrangements and fixtures to produce the parts of a watch so exact as to be almost interchangeable."—*The Times*, October 28th, 1876.

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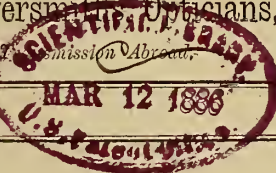
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HOROLOGY.

(Continued.)

XIII.—DIALLING.

DECLINATION.—Passing from trigonometry, as explained in our last number, we have now, before proceeding further, to deal with “declination” and “declinator,” before we go any further in the same direction. As the description which we shall have to give will require some thinking over, we may as well, in a homely way, tell the student to put his “considering-cap” on at once, and make up his mind for study. It must be remembered that knowledge of this kind, being of a solid and enduring nature, and calculated to raise its owner in an intellectual condition far above his fellows, it has, like the honest fruits of steadily-applied industry, to be steadily worked for. The old adage of “no royal road to learning” is especially true with regard to the mathematical phase of the reasoning powers. Calculating prodigies are not born every year; hence the intuitive feat of a Bidder, who could multiply twelve figures by twelve figures, mentally, without pencil or slates, is a phenomenon that the world does not often behold. Again, the late Zerach Colburn, for some time editor of *Engineering*, could multiply any number less than 10 into itself successively nine times, telling the results faster than they could be taken down. He called out from mental calculation alone the number 8 multiplied fifteen times into itself, and was right in every figure; he has multiplied two figures by two figures, such as 29 by 37, eight times; but that was a feat. He was asked, when a mere boy, at one of the private exhibitions of his powers, what number,

multiplied by itself, gave 106,929, and he replied 327, *before the question could be written for him!* he was further asked what was the cube root of 268,336,125, when he instantly answered, 645! Now, taking the most rapidly known methods, no ordinary person with whom we are acquainted could work out the result in less time than from three to five minutes. He was asked how many minutes there are in forty-eight years; he as quickly responded 25,228,800! Furthermore, “Could he tell what two numbers multiplied together would produce 247,483?” “Yes,” said he, on the moment; “the numbers 941 and 263 will do it.” And they are the only two numbers that will. The next wonder was for him to name a number that would divide 36,083 exactly. “There is no such number,” was the answer; and that is the fact. But the most extraordinary fact of all is, that the boy was entirely ignorant of the usual methods of calculation, and could not work out on a slate simple sums of multiplication or division! He could give the answer the moment he saw the figures; the rest was, therefore, superfluous. Numerous other examples could be given, but what has been already stated will be sufficient to indicate the nature of the only “royal road” to learning known, that is, being born with it. How few the instances are the world is already aware; and what has been stated here is more for the purpose of pointing the moral than adorning the tale. We will now proceed on our more particular way.

DECLINATION, in its relation to horology, is an astronomical term implying the distance of the sun, a star, planet, or any point of the terrestrial sphere from the equator, either northward or southward; and this declination is either real or apparent, according as the point under consideration is real or apparent. Here we are led to the properties of a great circle and what it means. A great circle of the earth, speaking of it as a sphere, is that which divides it into

two equal parts, or hemispheres, having its centre in the centre of the inscribed sphere. From this it can be deduced that all great circles are equal, and cut each other into equal portions or hemispheres. The great circles are the horizon, the meridian, the equator, the ecliptic, the colures, and the azimuth. Horizon is from the Greek word *orison*, a limit or bound; *oriso*, "I terminate;" signifying the upper and visible part of the earth in relation to the light of the sun being upon it, the lower half being in darkness or night, for the time being. The poles of this circle are called the zenith and nadir; the former meaning the point directly overhead, and the latter that as directly under foot. The meridian is that circle that passes through the poles of the earth and the place where the observer may be. It comes from *meridies* (mid-day) because when the sun in its course from east to west touches and passes through this circle it is said to be mid-day. The meridional circle is used to determine longitude as from a fixed point. Different nations have different meridians, but that of Greenwich pretty well regulates the east and west, and the time all over the world where civilization goes. The equator is the great circle of the sphere which is equally distant from the two poles of the world. It is called the equator, for the reason that when the sun is there the days and nights are equal. It is also called the equinoctial line; hence the phrase so common with sailors, "crossing the line." Every point in the equator is the distance of a quadrant from the terrestrial poles, by which it will be seen that the equator divides the earth into two hemispheres, one of which is the northern and the other the southern. Occasion frequently arises for the conversion of degrees of the equator into time, and for the reconversion of time into degrees of the equator. This was mentioned in a previous article when we spoke of degrees of longitude and time from the meridian of Greenwich, and of four minutes of time to one degree, and fifteen degrees to one hour. The ecliptic circle is that in which the sun seems to move in his apparent course round the earth. The name comes from the Greek word *ekleipsis*, a leaving or falling off; because it is in this circle that all the eclipses take place—the leaving, or falling off of the light of the sun, or of other planetary bodies, takes place, so far as our seeing them is concerned. The ancients had frightful ideas of eclipses, supposing them, like comets, to be the signs of terrible disasters. Plutarch, the historian of the times of ancient Rome, assures us that it was not allowed to talk publicly of any natural causes of eclipses. Great noise was made with high-sounding instruments, and loud shouting raised. During eclipses of the moon they believed that she was in some kind of maternal labour, and that the noises would assist her. In consequence of this belief a proverb arose; namely, that a very talkative woman was said to be making her tongue rattle for the purpose of helping the moon in the moon's labour. It may be as well to add that the talkative ladies by no means felt themselves complimented by the expression. Then the magicians were held to have had something to do with the affair, such as plucking the moon out of the sky and making her skim over the grass. The natives of Mexico formerly kept fasts during eclipses, and their women sacrificed certain parts of their bodies in sympathy with what they believed the moon to be suffering. They imagined that the sun, her husband, had been quarrelling with her, and had beaten and wounded her! The colures are two great circles imagined to intersect each other at right angles in the poles of the earth. The name comes from a Greek word *kolouo*, to cut off, and *oura*, a tail; they are so called because part of their imaginary course is invisible to us, and so seems cut off. One of them is said to pass through the solstitial and the other through the equinoctial point of the ecliptic. The equinoctial colure determines the equinoxes, and the solstitial the solstices. The ecliptic being thus divided into four parts, the four seasons of the year are thereby marked out. The azimuth circle is to denote an arch of the horizon comprehended between the meridian of the place and any given vertical. Again, it shows the angular distance of the horizontal point which is directly under a star from the north point of the meridian. As the meridian goes through the zenith—already explained—of a place, and is exactly perpendicular to the horizon, it will also be found to be a vertical circle. It is to altitude what longitude is to latitude, and what right ascension is to declination. It is the distance between two great circles passing through the zenith instead of through the poles; the reckoning is from the south point of the horizon. The name is a corrupted word from the Arabic, *as-samt*, the *as* being the article *al* assimilated to the initial letter before which it stands. The meaning of *samt* is "a way, a road, a path," and, more broadly, "a path, a tract, country or quarter." There is an azimuth circle for taking the altitude of the sun at sea; the theodolite answers the same purpose on land. The working of azimuth instruments involves a thorough knowledge of spherical trigonometry,

and is chiefly confined to the use of astronomers, navigating officers, and extensive surveys of large tracts of the earth's surface. The azimuth shows what distance the sun and any of the stars are from the horizon.

We have now, we believe, given a brief explanation of the great astronomical circles that are more or less connected with horology; but there are also other circles, such as diurnal ones, which are immovable, and are supposed to be described by the several stars, and other points in the heavens, in their daily rotation round the earth, or, to speak more correctly, in the rotation of the earth on its axis. These circles are all unequal to each other, the equator being the greatest. Then there are circles called "secondaries of the ecliptic," used for measuring the latitude of the stars, "circles of excursion," of "perpetual apparition," "perpetual occultation," and others not pertinent to this article. However, as what has been here stated is necessary to be known to the student of what is to follow, we will leave him to master the details until next month.

WONDERFUL MECHANICAL CONTRIVANCE.

AN entry in Evelyn's diary, of February 24th, 1655, gives an account of a curious mechanical contrivance which the writer had lately seen. This was a table-clock, the balance of which was only a crystal ball sliding on parallel irons, without being at all fixed, but rolling from stage to stage till it was thrown up to the utmost channel again, made with an imperceptible declivity; thus, by a continual vicissitude of motion, entering the eye every half minute, and the next half giving progress to the hand that showed the hour, and giving notice by a small bell, so that in 120 half-minutes, or periods of the ball's falling on the spring, the clock part struck. The clock was richly ornamented, and had been presented by a German Prince to King Charles I.

AN EXTRAORDINARY CLOCK.

THE French journals give us the following description of an extraordinary piece of mechanism in the way of clocks:—

"It chimes the quarters, plays sixteen tunes, plays three tunes every twelve hours, or will play at any time required. The hands go round as follows:—One, once a minute; one, once an hour; one, once a week; one, once a month; one, once a year. It shows the moon's age; the rising and setting of the sun; the time of high and low water, half ebb and half flood, and, by a beautiful contrivance, there is a part representing the water, which rises and falls, lifting some ships at high-water tide as if they were in motion, and, as it recedes, leaves these little automaton ships dry on the sands. The clock shows the hour of the day, day of the week, day of the month, month of the year, and in the day of the month there is provision made for the long and short months. It shows the signs of the zodiac; it strikes or not, chimes or not, as may be desired; and it has the equation table, showing the difference of clock and sun every day in the year."

TO SILVER CLOCK FACES, ETC.—Old silver lace $\frac{1}{2}$ oz., nitric acid 1 oz. Boil them over a gentle fire for about 5 minutes in an earthenware pot. After the silver is dissolved take the mixture off and mix it with a pint of clean water, then pour it into another vessel free from sediment, then add a tablespoonful of common salt, and the silver will be precipitated in the form of a white powder or curd; pour off the acid and mix the curd with 2 oz. salt of tartar and $\frac{1}{2}$ oz. of whiting all together, and it is ready for use. To use.—Clean your brass or copper plate with rottenstone and a piece of old hat, rub it with salt and water with your hand. Then take a little of the composition on your finger and rub it over your plate, and it will firmly adhere and completely silver it. Wash well with water. When dry, rub it with a clean rag and varnish with this varnish for clock faces:—Spirit of wine 1 pint; divide into 3 parts, mix 1 part with gum-mastic in a bottle by itself, 1 part spirits and $\frac{1}{2}$ oz. sandarac in another bottle, and 1 part spirits and $\frac{1}{2}$ oz. whitest gum benjamin in another bottle; mix and temper to your mind. If too thin, add some mastic; if too soft, some sandarac or benjamin. When you use it warm the silver plate before the fire, and with a flat camel's hair pencil stroke it over till no white strokes appear, and this will preserve the silvering for many years.

IMPORTANT PROSECUTION BY THE GOLDSMITHS' COMPANY.

AN important prosecution, affecting the fraudulent simulation of an antique plate, has been instituted by the authorities of the Goldsmiths' Company; and the steps thus taken by the great civic guild to which is entrusted the responsible duties of assaying and stamping the precious metals will be considered of special interest to the trade in general. The proceedings are against Edwin Brown, electro-plater, of 71, Princes-street, Leicester-square, who is charged with feloniously transferring the marks of dies used by the Goldsmiths' Company in London to certain goods in base metal, with intent to defraud.

At the first hearing of the case the assistant clerk to the Goldsmiths' Company pointed out that, for some time past, a practice had been systematic of transferring old hall-marks into plate of an inferior alloy; but there had been so much difficulty in tracing the real offenders that the company had hesitated to initiate prosecutions of which the issue must necessarily have been uncertain. At last, however, a clue was obtained which could be followed right to the centre of the labyrinth of fraud; and the particular electro-plater in question was summoned to account for his malpractices.

A man who had worked for him for twelve months past deposed that he had chased for the prisoner, last March, a cream-ewer, which was produced in court, and the bottom of which, when the workman took it in hand, had no hall-mark upon it. He had also worked on a coffee-pot, which was likewise produced, and he saw a new base being affixed to it—the base being that of an old salt-cellar. These articles were sold to a silversmith in Oxford-street. A gentleman in the assay office of the company, who had been in its employ for thirty years, testified that he saw the two articles in the window of the shop in Oxford-street; and that he subsequently purchased them. They were then examined at the official's leisure; and it must be here explained that at Goldsmiths' Hall a register is kept of the marks put on plate during successive years, and that for every twelve months the stamp of a different year is used. The cream-ewer which had been bought in Oxford-street bore a small Roman "I," with the usual additional marks of the Company, and the associated marks represented the date of the plate to be the year 1744. The cream-jug was then assayed, and was found to be of inferior silver. Another bottom had been soldered to the original base, there being a layer of solder between the two. The coffee-pot bore the letter "M," thus purporting to have been manufactured, or at least marked, A.D. 1747. On assay it proved, like the cream-jug, to be two penny-weights under the legal standard. A summons to compel the Oxford-street tradesman's appearance was therefore taken out, and the captive electro-plater was remanded without bail. That bail should have been refused may at first sight appear rather harsh, but Mr. Newton was of opinion that it was of the utmost importance that neither the principals nor the accessories—whoever they might be—in the fraud should be afforded any opportunity for collusion or for "squaring" things, so as to make them "comfortable" either for the perpetrators or the instigators of a most pernicious and barefaced swindle.

At the second hearing on the 24th ult. Mr. W. S. Prideaux, of the Goldsmiths' Company, prosecuted, and Mr. J. A. Alsop defended. Mr. George Lewis, sen., represented Mr. Gooch, a person concerned in the case. Mr. David Lazenby Gooch, silversmith, 504, New Oxford-street, was then sworn, and in reply to Mr. Prideaux said: "The cream-ewer produced I had in my shop. It was brought to me by Brown, with other articles. I gave 10s. 6d. an ounce for it. Nothing was said at the time about the make. I assumed it to be old and genuine. I looked at the mark. For a modern one I should have had to pay about 9s. an ounce. I had another coffee-pot of a similar kind and sold it. I gave 12s. per ounce for it, and bought it as old. Both articles were brought to me by the prisoner himself as being old."—By Mr. Alsop: "I bought the coffee-pot first. I saw it first on going to the prisoner's shop respecting some repairs. It was plain then, and he asked me to buy it, stating that he was going to chase it. I told him to let me see it when it was chased, and he did so, and I then purchased it. I bought the coffee-pots in February, and the cream-ewer in March. I cannot say to whom I sold the first coffee-pot. It was hall-marked. I sold it for 9l., having given 7l. 12s. for it."—In reply to the magistrate, the witness said that he sold it as old, and did not know that it was not so.—By Mr. Alsop: "I bought the cream-ewer as an old article at 10s. 6d. per ounce, paying 6l. 5s. 6d., and I have the entry in my books."—Some further evidence was given, and the prisoner was committed for trial.

THE APPARENT SIZE OF THE MOON.

DR. MONTUCCI contributes to the *Mémorial Diplomatique* the following particulars referring to the apparent difference of the diameter of the moon, and in which he endeavours to prove that it is due solely to refraction.

"Everybody," he says, "must have noticed the enormous size of the full moon when it rises at dusk, just when the sun has set. That it is owing to an illusion is notorious—first, because our satellite cannot undergo any real change in size during its short progress from the horizon to its culminating point; and secondly, because, whether observed at the former or the latter, the micrometric measurement of the visual angle under which it is seen is always the same. This curious circumstance has always been a puzzle to scientific men. La Place says that, since the celestial hemisphere above our heads appears to us depressed, the rays coming from the horizon must seem to us longer than those from the zenith. Other physicists, finding this explanation unsatisfactory, assert that our judgment is led astray at the horizon by the trees and houses bordering on it, and which, having a size known to us by habit, induce us to compare the moon to these objects, and so to think it larger than it is at the culminant point, where it is quite alone, without any type of comparison in the vicinity. To prove this explanation of theirs, they prick a hole through a card, and look through it at the moon on the horizon, thus covering all the terrestrial objects that might lead us astray; and in this way the moon's disc is indeed reduced to a much smaller size." Dr. Montucci expresses his astonishment at finding that atmospheric refraction, the only reasonable cause of the phenomenon in his opinion, is not only overlooked in this question, but actually rejected by all school-book writers on natural philosophy, as well as by graver men. The demonstration by the pricked card he shows to be worthless; "for," says he, "go about in an evening and look at the gas lamps through the card, and you will find them suddenly dwindle down to pins' heads, because you reduced the radiation of light by narrowing the field of vision. In the same way, if you look at the moon, it becomes less, just like the gas flame; but do not imagine that it is thereby reduced to its culminating size. No, you cannot have two sets of weights and measures; if you look at the moon through the hole when she is at the horizon, you must do exactly the same when she is at the zenith; and then you will see her smaller than ever you saw her." The card thus being set aside for ever, Dr. Montucci proceeds to examine whether the illusion can be brought about by a type of comparison, and he enumerates several reasons why it cannot, among which is this: When the moon rises close to a large mass of houses or a mountain standing out in high relief above the real horizon, she loses her exaggerated diameter very quickly as she goes higher up; so that, by the time she has reached the top of the prominent object, she has diminished considerably. But that object is still there—it has not changed: then how comes it that, the type of comparison being the same, the object compared has diminished? Illusion from that source cannot therefore be pleaded here. Dr. Montucci next takes up refraction as the sole explanation possible. The misty atmosphere presents itself to the eye of the observer as a concave lens: the moon is outside, and forms with the atmosphere a divergent lens, which enlarges objects on a dark ground. Hence the moon, as well as all terrestrial objects are increased in size on being projected by refraction through the atmosphere. This view of the case, the author confirms by various experiments with concave lenses.

A NEW ENGRAVING AND CHASING MACHINE.

A NEW machine for producing chased or engraved groundwork on gold, silver, or plated jewellery has been patented by Mr. Atchison, of Boston, U.S.A. The machine is adapted to requirements for working on any thickness of metal, and engraving tools of different sizes. Can be removed and fitted according to the work intended to be done. In describing the machine an American journal says:—"The ground-work is produced on the metal with great rapidity, the tools delivering 5335 cuts per minute, and the apparatus can be attended by a child. As the sale of jewellery and silverware depends almost entirely upon the ornamentation, it need hardly be added that a machine of this description, making a very excellent imitation of handwork, is one of considerable economical value to the jeweller and plate manufacturer. We are informed that the machine produces fourteen styles of groundwork, claimed to be superior to satin, or pearl, or sand blast finish in depth, durability, and beauty."

PRECIOUS STONES.

(Continued from page 271).

BOORT.

THIS particular species of adamantine carbon, which seems placed by nature between crystallized carbon and the pure diamond, bears a name of unknown etymology, but certainly of Dutch origin. Most frequently it is of spherical form, and its crystallization is so irregular that it resembles the most complicated knots in certain woods.

It is a mixture of molecules without order or continuity, and these, adhering by the force of cohesion, are the cause of its wonderful hardness.

It has not any regular cleavage. The boort is externally more rough than some uncut diamonds; most frequently it is of a greyish-white, and cannot acquire the diversified colours of the pure diamond, which it, however, exceeds in specific gravity. With us it is only used to polish the regularly crystallized diamond; and for this purpose it is pounded in a mortar, and its dust, mixed with oil and spread over a surface of soft iron, renders the friction of the true diamonds more efficacious, and this assists in obtaining the polish and splendour of the different facets.

It is known that, whatever the variations of certain crystals, it is easy by means of their cleavage to reduce them to a regular determined form; but in the knotty diamond this is impossible, as its texture does not permit of cleavage.

The knotty diamond is found in the mines of Brazil, whence it is sent to Europe.

Some people say that the boort is cut and used by the Orientals; but, even if this be so, they certainly have not in it a bright or valuable gem.

CACHOLONG.

A barbarous name not yet translated into any European language, and originating in Bokhara, from the words of its dialect, *cach*, river, *cholong*, stone; that is, "stone of the river." It belongs to the variety of the opal calcedony; opaque on the surface, and of a milky white; when broken, the interior has a pearly reflection, slightly translucent at the sharp edges. Harder than the opal, this substance takes a good polish; it is unaltered under the action of the blow-pipe, and its specific weight is 2.2.

The cacholong is found in separate bits in the rivers of Bokhara, in the Feröe Islands, in Ireland, in trap-rocks, and in Greenland.

It is also procured in France and in Champigny, near Paris; it is brought from the caves of calcareous breccia, and some of it is hard, of bright cleavage, whilst others are light, rough to the touch of the tongue, and soft as chalk, and therefore of inferior quality, and to be regarded as imperfectly formed.

There is a variety of this stone called striped, coming from Feröe and Ireland, which, being composed of thin strata of white and opaque opals over strata of calcedony, often bluish or greenish, makes very fine cameos. Italian artists call it French stone.

CALCEDONY.

This hard stone is thus named from the province of Calcedony, in Asia Minor, whence, in ancient times, it was procured in great quantities. It is a variety of agate quartz, generally of a milky-white colour, sometimes bluish; and this last tint somewhat increases its value.

The calcedony is semi-transparent, but sometimes opaque and translucent. Its cleavage, although concave, is a little scaly and quite opaque, which helps to distinguish it from the carnelian, the sardonyx, the plasma, the chrysoprase, the onyx, silix, and cacholong. It is found abundantly in uniform pieces, or in strata, within nodules of agate, and is round, uniform stalactiform, primitive rhomboidal, and seldom in crystallized cubes; under this last form it encrusts crystals of shining quartz, of indrepore, of wood, and of various other substances.

It is not fusible, nevertheless the colour pales under the action of heat, but without producing water.

Its specific weight is from 2.6. When analyzed the result is—

Silix ...	...	...	...	...	...	...	84
Alumina ...	...	...	...	...	...	...	16

Sometimes alumina gives place to lime.

Like all gems, it is distinguished into Oriental and Western.

This latter, less hard than the other, and also than the white agate, is of a milky light; it is common, and but little valued. There is one remarkable variety which has red or grey dots on a

striped milky ground, and is known by the name of stone of St. Stephen.

According to Pliny, the fine calcedonies so much esteemed by the ancients came from Africa; they were bought at Carthage, and then cut and engraved in Rome. At present this stone is found in France, England, Scotland, Ireland, Transylvania, Norway, Iceland, and the Feröe Islands. Those of a green colour are procured only in India, and are very rare. Those specimens, however, are particularly prized which contain a drop of water inside, although it does not always remain, as can be observed in some rock crystals, from which the water at last disappears by means of evaporation.

The term "calcedonious stone" is applied to all gems having internally a milky tint. Rubies, sapphires, chrysolites, bluish diamonds, all diminish greatly in value when the term is applicable to them.

The ancients used the calcedony very much in making valuable ornaments; the primitive Babylonish seals, in form of the cylinder, and the latest Sassanian stamps were formed of this stone. We also see Etruscan scarabæi and Greek and Roman intagli in this material.

Statuettes of the period of the decadence of Roman art are found in this material, and it appears that bluish calcedony was considered better and preferred for this kind of work.

CALCEDONYX.

This stone is very rare and little known; its name is an abbreviation of calcedononyx. Its rarity therefore is the cause of the difficulty that exists in distinguishing it from the onyx agate, which it much resembles. It is much harder than this stone, but the difficulty of determining the degree of hardness without testing the stone prevents the possibility of ascertaining whether a given substance be really calcedonyx, except by the lapidary who tests it on his wheel.

Barbot is said to have determined the specific weight of this substance, which, according to him, is 2.6180.

It is often even more translucent than agate.

It appears that it came from the East, and was not only known to, but engraved by the ancients, and these engraved stones are the only specimens in existence of the calcedonyx, as at present none is found in any part of the world that we are aware of.

In the ancient collection of Genevoso, Caire saw an engraved calcedonyx representing a warrior seated opposite a dead body. In the Viennese cabinet of engraved gems there is another, which represents a young man leaning on a column.

CHINESE SILVERSMITHS.—The men of the Shan tribes, in the kingdom of Pong, China, are expert silversmiths:—"Their enamels are very brilliant, and employed with beautiful effect in the floral patterns which form the principal stock of designs. The only other forms of ornamentation, the rope-shaped fillets and rounded studs or bosses, singularly resemble those found on the diadems or armlets of the early historical periods of Scandinavian art. The plain torques or neck-rings in use, especially among the Hotha Shans, only differ from the ancient Irish type by their more rounded form, and by the pointed ends being bent outwards, in lieu of being expended into cymbal-shaped faces. Another kind of torque is of the same shape, but covered with leaf ornaments and cones in filigree and enamel, alternating with red or blue stones or pieces of glass. Torque-like, hollow rings, covered with floral enrichments, are worn as bracelets; sometimes they are gilt with very red gold and enamelled, a jewel being usually set in the centre. Another form is a silver hoop, nearly two inches in breadth, with rounded edges and filigree borders, most elaborately set with floral rosettes of three circles, rows of leaves, brown, green, and dark purple, centred by a large silver stud."—From "*Mandaly to Momien*" by Dr. Anderson.

THE ALEXANDRA FOUNTAIN TOILET (one of which has been presented to the Princess whose name it bears, and who by letter expresses her great admiration), meets many requirements in the Toilet Bottle. It is always stoppered, and does not allow the perfume to evaporate; and by pressing a small ornament at the top, you get a fine jet of perfume, just sufficient for the handkerchief, without saturating it and wasting the perfume. The great object of this invention is the obtaining of liquid perfume from the bottle in the form of a jet by simply pressing the knob, thereby dispensing with the opening or closing of the bottle and ensuring no waste of scent. Owing to the usefulness, cheapness, durability, and beauty of these bottles they are likely to supersede all others.

THE Turners' Company will this year give their silver medals and the freedom of the company to the workman showing best specimens of hand-turning in wood, pottery, and diamonds.

THE EYES AND SPECTACLES.

AN old writer, living before the days of illuminating gas and kerosene, remarks that the "first sign of the need of spectacles is a tendency to bless the man who invented snuffers." In this age we should say that the first sign is to find one scolding about the publisher of his daily newspaper, who is charged with filling his columns with type growing every day more diminutive and indistinct. When a man or woman reaches the age of forty-five or fifty, it is generally found that some aid to the natural vision is required. The discovery of this want is very liable to be made soon enough. There is also a foolish pride which prevents some people from adopting spectacles after the discovery is made, and the eyes suffer greatly in consequence. There is no truth relating to vision more important, and which, therefore, should be more clearly understood, than this; that in every case of defective eyesight, whether it proceeds from advancing age, or from congenital causes or from accident, artificial aid should be resorted to without delay. The tendency is in all, or nearly all, cases towards irreparable injury, when this aid is withheld. It is true, bad or ill-adapted spectacles may, and do, cause injury, and so do improper medicines, or injudicious food or regimen. If proper care is used in selecting glasses, and the right ones obtained, they strengthen vision, and the vigour of all the functions of the organs concerned in the phenomenon of sight is increased. A child discovered to be "near sighted," should be promptly furnished with appropriate glasses, and they should be selected, if possible, under the advice of a competent medical man or optician. In the case of persons who have passed middle life, as soon as it is noticed that the best artificial light is sought, or that letters grow apparently smaller or less distinct, or that the near point at which one can see distinctly is more than eight inches from the eye, the time for spectacles has arrived. In adopting them under these circumstances, we place an artificial lens outside of the eye to supplement the natural change of that within the eye, and by doing so, we add to power and normal action of the whole optical apparatus. The use of spectacles enables the eyes to work comfortably without fatigue; and they should always be strong enough to effect this object. It is difficult to give any rules for selecting glasses, as there are many exceptions to be considered. The natural changes in vision come on gradually, and glasses need to be changed to meet this modification as age advances. At first the change is slight, and may not several years after it commences be so marked as to become positively annoying. In the early periods of decay of sight, glasses having a focal length of 60 inches will usually suffice; later in life they must be changed for those of forty, or even ten inches.

Glasses of a focal length of 60 inches will require one to hold the object looked at a distance of 14 inches. If, at 14 inches, the letters of a book are seen most distinctly, the focal length of the glass is usually well adapted to those whose vision is slightly impaired. The distance should be quite accurately measured, as glasses of ten inch focal length require a modification of the reading distance, of only about three inches less. The first spectacles should at first only be used for reading in the evening, and when no longer sufficient they may be superseded for evening work by others, and the first pair reserved for reading by daylight, or for writing, which requires less critical vision, especially if ink be used that flows black from the pen.

Short-sightedness is a malformation of a somewhat serious nature, as short-sighted eyes are diseased ones, and they require special treatment. Never allow a child or a friend thus afflicted to fall into the hands of "travelling quacks," or those who make loud claims to optical knowledge. In all large cities there are reputable medical gentlemen who make a speciality of the treatment of eye affections, and they are the proper persons to consult. It cannot be too universally known that short sight tends to increase; and that if it increases at all rapidly, it tends also to destructive changes, and therefore it is an affection which requires prompt attention.

Perfection of eyesight is essential to our welfare and happiness, and any one who neglects these precautions, upon the observance of which its preservation depends, will find cause for deep repentance in later life. Young men and young women who suffer themselves to fall into the habit of reading by fire-light or at a window by the waning light of evening, or at a considerable distance from lamps and gas burners, are guilty of acts for which they must suffer. Parents should promptly interfere to prevent the formation of such dangerous habits.

In the use of glasses, the tendency is toward those which are held in place by a spring pressing upon the nose. This form is convenient, and will do very well for purposes other than for reading

or writing, when prolonged use is required. The nip upon the nose is often painful, and creates uneasiness; and besides the focus is liable to become disarranged. For these reasons and others, the glasses held in place by bows passing behind the ears are the best and safest for reading and study. The lenses should be of the best construction, and pure crown-glass affords a material better than "Brazilian," or other "pebbles." The frames of spectacles should be of blue steel, light, strong and perfectly fitted to the wearer. They should be kept perfectly clean, and this should be accomplished by the use of soft wash leather, and not by linen handkerchiefs, which are apt to scratch the lenses by the small particles of silicious or other hard substances which they hold.

TRAVELLERS.

THE following remarks (extracted from the *New York Jewellers' Circular*) concerning travellers are by no means inappropriate to our pages, and may be read with interest and advantage to firms having such representatives.

"Good work 'on the road' demands the best sort of men. The work is severe, the wear and tear terrible, the temptations great, and the reward seldom over-high. It takes a sound body to stand the fatigue, a clever tongue to do the business, a clear head to pass judgment on men. The success or non-success of a house often rests with its travellers, and we see new concerns built up into stability by the shrewdness of their 'drummers,' and old ones ruined by their recklessness every day. Too much stress can therefore scarcely be laid on having good men 'on the road,' or too hearty credit awarded to the better class of travellers.

"It is therefore evident that first-class houses should be represented by first-class travellers, men who know the trade and how to reach them, and know also, what is more important, whom not to reach; cautiousness as well as enterprise is needed on the road quite as much as in the home management of a house, and no small portion of losses sustained by the trade is to be attributed to the employment of the youthful and inexperienced travellers more anxious to sell goods than cautious to protect the interest of their employers.

"We do not mean by this to say that younger men are not to be employed as travellers, and it is to be said that many heads of houses of the present day made their position by good work on the road when they were young men. But the standard has been lowered since that day, and first-class houses employ callow men they would not have thought of employing fifteen or twenty years ago. We are putting in a word for the employment of the best men, at fair wages, men who understand their business and their customers. A good house cannot afford to economize on its travellers, who are to it what scouts are to the general in command. It is their business to gauge thoroughly the responsibility of any house of which they deal, to get at the bottom facts; they keep their employers thoroughly informed as to the foundation of any rumour affecting credits. And for such purposes experience can be replaced only by marked ability. Aside from the question of gaining an audience where less able men would be refused, the traveller's knowledge of the character and relation of his connection is to be acquired only by a considerable apprenticeship of careful attention, and the winning of wide and familiar acquaintanceship. His knowledge is then part of the capital of his house.

"But no article upon commercial travellers is at all fair which does not emphasize the patient hardships of their life. To get 'on the road' is the chief ambition of a host of youngsters, but it means the hardest work going. The strain on the nervous system is terrible, and life is soon spent, too, often with little thanks. The traveller must work all day and travel all night, be always in trim, no matter what he may have had to stand, prove himself wise as the owl and cunning as the serpent. There is no rest for him, and too often no thanks. He has everything to lose and little to gain. All this should be recognized by employers, and the best way to recognize this is the practical economy of paying for the best men that can be got. Make it worth while, in short, for good men to take to the road."

A GOOD LACQUER.—A preserving lacquer for brass or bronze which gives a beautiful gilding to the articles, is prepared simply by dissolving 332 parts of rectified spirit, 16 parts of shellac, 4 parts of dragons' blood, and 1 part of turmeric root. The metal to be lacquered is warmed, and the varnish applied by means of a sponge. Brasswork becomes beautifully gilded by this application. As the liquid is a spirit solution it is, of course, necessary to keep it in a well-stoppered bottle.—*Scientific American*.

FINGER RINGS

(Concluded from page 275).

IN the *Journal* of the Archaeological Institute, vol. iii., is an engraving of a curious magical ring copied in Fig. 66. It was found on the coast of Glamorganshire, near to "the Worm's Head," the western extremity of the county, where numerous objects have been found at various times on the shifting of sands, such as fire-arms, an astrolabe, and silver dollars. This ring is of gold,



✠ ZARA·ZAI·DE ZEVEL

✠ DEBAL·GVT·GVT TANI

FIG. 66.

much bent and defaced, and inscribed with mystic words inside and outside the hoop. Their talismanic character seems to be sufficiently proved by the English medical manuscript preserved at Stockholm already alluded to, in which, among various cabalistic prescriptions, is one for "peynes in theft. . . . Boro berto briore + vulnera quinque dei sint medicina mei + Tahel + Ghether +++ Othman." The last word should probably be read Guthman, and it is succeeded by five crosses, possibly in allusion to the five wounds of the Saviour.

As a preventive of peril by travel and sudden death, the names of the three Magi, or the "Kings of Cologne," as they were more popularly termed, were believed to be the most efficacious. Their bodies travelled first to Constantinople, thence to Milan, and lastly to Cologne, by various removals. The faithful may still view the skulls of the Arabian kings who visited the Saviour in the manger (if we can believe the old legend,) in the richly-jewelled reliquary, guarded so sacredly in the Cathedral of Cologne. Their possession brought enormous revenues to the building, and a heavy tax is still imposed on all who would see them. It was once believed (and may be still) that anything that had touched these skulls had a protective virtue. Their names acted as a charm, and were inscribed on such articles of wearing apparel as girdles, or garters, of which many specimens exist in the curious collection of Mr. C. Roach Smith, and were found at London in excavations, or in the Thames.

Upon rings they are most common; two are here selected from the Londesborough collection. Fig. 67 is a thick gold hoop, inscribed with their names, Jaspar, Melchior, Balthazar, and the abbreviated



FIG. 67.



FIG. 68.

motto, "In·god·is·a·r·;" which the late Mr. Crofton Croker thought might probably mean "In God is a remedy." Fig. 68 furnishes a good example of a fashion of hoop ring prevalent in the fifteenth and sixteenth centuries, flat inside and angular outside. Each face is inscribed with the same talismanic names. It is formed of cheap mixed metal, was found in London, and presented to the collection by Mr. Roach Smith.

Inscriptions on rings became at this time very common, nor were they confined to mystic or sacred words. Mottoes of love and gallantry were frequent, as well as moral sentences, and those strictly heraldic. In the curious inventory of the plate and jewels of the Duke of Anjou, compiled about 1360, mention is made of a ring with



FIG. 69.



FIG. 70.

a large square emerald surrounded by letters in black enamel. The representation is copied in Fig. 69. It is a weighty ring of fine gold, and was found in 1823 at Thetford, in Suffolk. The device which appears upon this ring is an eagle displayed; on the inner side is

engraved a bird, with the wings closed, apparently a falcon, with a crown upon its head. The following poesy, or motto, commencing on the outer side is continued on the interior of the ring:—DEUS. ME. OUROYE. DE. VOUS. SEUIR. A. GREE. COM. MONN. COUER. DESIRE.—"God work for me to make suit acceptably to you as my heart desires." The devices appear to be heraldic, and the motto that of a lover, or a suitor to one in power. The eagle is the bearing of several ancient Suffolk families. It was also a badge of the House of Lancaster, and Thetford was one portion of the Duchy of Lancaster.

These mottoes, or "reasons," as they were sometimes termed, were occasionally engraved in relief. Fig. 70 represents a specimen from the Londesborough collection. It is of gold, and was found in the Thames. The inscription upon it is—SANS VILINIE—"Without baseness,"—a motto that may have been adopted by some Bayard of the middle ages.



FIG. 71.



FIGS. 72, 73.

A very early ring, with an unusual pretty poesy, is in the collection of J. Evans, Esq., F.S.A., and is engraved (Fig. 71). It is of gold, set with a small sapphire, and is inscribed—JE. SUL. ICL. EN. LRV. D' AML—"I am here in place of a friend."

It was probably made at the beginning of the fourteenth century. Fig. 72 is chased with Norton's Motto, "God us ayde;" and Fig. 73 is inscribed withinside with the sentence, "*Mulier viro subjecta esto.*" Both are works of the fifteenth century.

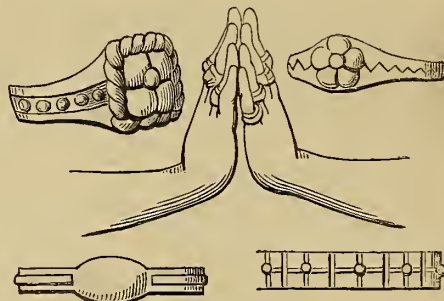


FIG. 74.

In Bromsgrove Church, Staffordshire, are the fine monumental effigies of Sir Humphrey Stafford, and his wife (1450), remarkable alike for the rich armour of the knight, and the courtly costume of the lady. She wears a profusion of rings, every finger, except the little finger of the right hand, being furnished with one. They exhibit great variety of design, and are valuable as exponents of the fashion of that day. We engrave in Fig. 74 the hands of the lady, as uplifted in prayer, with four of the rings, the full size of the originals.

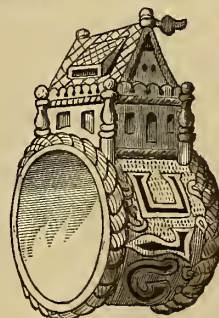


FIG. 75.

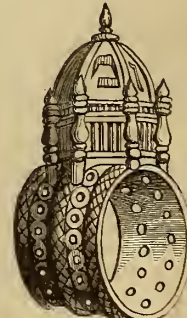


FIG. 76.

Recurring to the ancient people whose sacred records gave us the earliest knowledge of the use of rings we may profitably devote some attention to the very beautiful rings formerly used by the Hebrews for betrothals and weddings. The Londesborough collection furnishes us with two fine examples, engraved in Figs. 75 and 76. They are often termed "tower rings," from the figure of

the sacred temple placed on their summit. In the first specimen it takes the form of a hexagonal building, with a domed roof of an Eastern character; in the second it is square, with a deeply-pitched roof, having movable vanes at the angles, and is probably the work of some German goldsmith. Upon the roof of the first is inscribed in enamel letters the best wish—"Joy be with you"—that a newly-married couple would command. The same words are inscribed in more richly-designed letters on the curve of the second ring. Both are of gold, richly-chased, enamelled, and enriched by filigree work, and are sufficiently stately for the most imposing ceremonial.

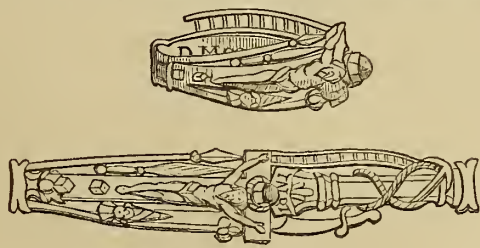
A third Hebrew ring of less striking appearance, but of equal or greater curiosity, is also engraved from the same rich collection shown in Fig. 77. It bears on its surface a representation (in high relief) of the temptation of our first parents, who are surrounded by various animals, real and imaginary, their joint



FIG. 77

residents in Paradise. The workmanship of all these rings has been dated to the commencement of the sixteenth century.

We close our series with a wedding ring, commemorative of a marriage which excited the marked attention of the entire Christian community, as a vigorous protest against monkery by that "solitary monk that moved the world"—Martin Luther. Renouncing the faith of Rome, he revoked his vow of celibacy, and completed its total severance from its creed by marrying a lady who had once been a nun, named Catherine Boren. The ring, here engraved, is that used on the occasion. It is of elaborate design and execution; a group of emblems of the Saviour's passion, the pillar, the scourge, the spear, and various other objects, com-



D Martino Luthero Catharina Boren

13 JUNI 1525

FIG. 78.

bine with a representation of the crucifixion, a small ruby being set in the centre of the ring above the head of the Saviour. We engrave this most interesting object of personal decoration as it appears to the eye (Fig. 78), and also the full design in plans; beneath it are the names and date inscribed on the inside of the ring.

THE SICKER SAFE AND STRONG ROOM COMPANY have removed from Cecil-street, Birmingham, to their new and extensive works at Soho. Messrs. W. C. B. Cave and Alfred Rhodes, of Birmingham, were recently elected as Directors, the first-named gentleman as chairman.

THE *New York Jeweller's Circular*, that deservedly popular organ of the jewellery and kindred trades in the U. S. of America, has recently changed its appearance, and now reaches its readers in an improved form. Its cover has elaborate and emblematic designs, and without undue flattery we may truly welcome it as "the handsomest paper of the kind in existence." Any praise which we could bestow would in truth fall short of its many merits, and in extending to it our hearty welcome in its "new attire" we would sincerely add our best wishes for its uninterrupted prosperity and success.

ACTION OF SUNLIGHT UPON PRECIOUS STONES.

DR. SCHNAUSS has directed attention to the fact that certain minerals are quite sensible to the action of light. Strangely enough this property extends to the very hard minerals, and reaches its maximum in the hardest of all minerals, the diamond. According to Dr. Fright, under certain circumstances the coloured diamond is as sensitive to light as chloride of silver. The ancients knew that certain coloured precious stones gradually grew paler in the sunlight, and that this was very distinctly the case with the beautiful grass-green chrysoprase. They said that when worn for a long time set in a ring or pin, it finally lost a greater part of its beautiful colour, and that this could be recovered by wrapping it up in a cloth soaked in wine and keeping it in a cellar. Even the much harder, transparent, dark green emerald is also influenced by light in time, as the author found to his sorrow in the case of an emerald ring, which he had worn seven years.

The diamond, however, exhibits the most interesting phenomena under this influence. If coloured diamonds are highly heated, the colour disappears more or less completely, and in most cases permanently. Sometimes the colour is merely changed by ignition, and the original colour may be restored by the influence of the sun's light. A diamond merchant named Martin exposed a diamond to a very high temperature, in order to destroy its brownish colour, but the stone became a permanent rose red. Coster treated another diamond in the same way, and that too turned rose red; but the most remarkable part was that this colour was only permanent in the dark, and disappeared in four or five minutes if exposed to the sun's light, the stone acquiring a weak brown colour. This change also took place in a room where the light was by no means bright. Another diamond, of a dirty yellow colour, was ignited in a current of hydrogen in a porcelain tube and allowed to cool there. The colour disappeared, but not the lustre. If this specimen was exposed to diffused light for six minutes its original colour returned. The experiment was repeated in this way, the stone being heated in chlorine gas, at as strong a heat as could be obtained by saturating the gas used by benzol vapour; it was farther heated at a lower temperature in a mercury bath, the diamond being wrapped in platinum foil; each time the colour disappeared and remained absent in the dark, but as soon as the stone was exposed for a few minutes to diffused daylight it regained its yellow colour.

These phenomena are thought by Dr. Schnauss to be related to that of phosphorescence. In addition to the cases mentioned by him, we would recall the fact, usually stated in text-books on mineralogy, that a variety of topaz from Brazil, when heated, assumes a pink or red hue resembling that of the Balas ruby.

CLOCK CASE MANUFACTORY.

DURING a recent visit to the North we had an opportunity of personally inspecting the extensive manufactory of Messrs. Tancenberg & Co., at Leeds. In the workshop we saw cases of every conceivable design and pattern in hand, and found that an immense number are turned out every week. Passing into the fitting room, we found a large number of hands busily employed in regulating and fixing the works in cases, and others timing and setting watches.

We believe that the secret of the success of this house is the energetic manner in which its business is conducted—the many and successful exertions which it puts forth to offer new patterns and designs, and thus present attractions which keep up a steady trade even in dull times. Established over twenty-seven years, the firm has deservedly gained a reputation which places it far above any remarks of praise, nevertheless the agreeable surprise which we experienced in visiting and inspecting the establishment is well worthy of being alluded to as an evidence of the extent of trade which is carried on by this house in every description of goods to which we have referred.

A NEW PATENT SELF-REGISTERING FIELD AND OPERA GLASS.

MESSRS. ELIAS DRUIFF & CO., of Hatton Garden, have just introduced a new field and opera glass possessing very many excellent advantages, among which is the desirable one that when once adjusted to the sight, an index marks the particular sight required, and it is easy to set it thereto at any moment; besides which, it can always be kept in that particular position either while in use or when in the case. The glass is a decided improvement on the previous styles, and will no doubt have a very extensive sale as it is moderate in price and superior in make and finish.

LOAN COLLECTION OF SCIENTIFIC APPARATUS AT THE SOUTH KENSINGTON MUSEUM.

THE exhibition alluded to above was privately opened by Her Majesty the Queen, on the 13th ult., and, as the *Times* justly remarks, "although the Loan Collection is the exact equivalent, as regards science, of the collection we have foreshadowed as regards art, it is far too early for an equal amount of popular interest to be taken in it. The interest, however, if more limited, will perhaps be, on the whole, more intense in the case of those interested at all, for our people are beginning gradually to learn what science has done and what its future position must be, especially in a country like England, where science is wanted so much, if it be taught so sparingly. We believe it is no secret that those who have had to do with the formation of this collection have found in many cases that for want of such a national repository many instruments in the possession of private persons—instruments of the highest importance now that the history of science is looked after—have either been broken up or lost. This remark applies even to our public departments, which, as a rule, have only to do with the present, so that an instrument, however great its value may be from a scientific point of view, is regarded as lumber the moment it is superseded. The recommendation of the Duke of Devonshire's Commission, therefore, that a museum should be established, doing for the Physical and Mechanical Sciences what the British Museum—to take an instance—does for the science of Natural History, is one which might be carried out in the most perfect and at the same time economical manner in course of time, if it were understood that instruments that had served their purpose, whether for investigation or for use, would find an asylum where they would be looked after. It is rumoured that the Royal Society is not disinclined to transfer the instruments that it possesses to the charge of the nation under proper guarantees.

"It is a subject of general regret that America, being so occupied with her Exhibition, has up to the present time sent nothing to the collection. The activity of American men of science is so great, especially in the fields of astronomy and geological exploration, and science is so much more warmly taken up both by the States and the Central Government there than here, that the collection would have been much richer for their contributions. As it is, however, American activity is by no means unrepresented, English men of science having contributed objects they have received from their American friends.

"The decision of the authorities that the Loan Collection, like the Kensington Museum, shall be open free on Saturdays, Mondays, and Tuesdays from 10 a.m. to 10 p.m., and that the charge for admission on other days shall only be 6d., is, we think, a very wise one. If the Science and Art Department can look after the interests of non-scientific visitors by organizing demonstrations of the various instruments, or, at all events, a daily bill of fare of some kind which shall throw life into the memorials of the past, and into the uses and applications of the instruments used in the present day, we think it possible that such demonstrations would be as warmly appreciated by outsiders as the series of conferences already announced is sure to be by the men of science themselves.

The first of the Conferences arranged in connection with the exhibition was held on the 16th ult. The section "Physics" was selected for the opening day, the President being Mr. W. Spottiswoode, F.R.S., and the Vice-President, Mr. W. de la Rue, F.R.S., Professor Cary Foster, F.R.S., Professor Guthrie, F.R.S., Professor Tyndall, F.R.S., Professor Sir W. Thomson.

The proceedings commenced with a few words of welcome from Viscount Sandon, who spoke as follows:—I have come down to express my gratitude, and that of Her Majesty's Government, to the different men of science who are the real authors of what I may call the present success. I have had means of knowing personally the extraordinary sacrifices of time and labour of those men of science in this country who have produced the success. It is gratifying, if only for one reason—it has shown what a feeling of intellectual brotherhood exists. We have had the highest men of science of this kingdom working together to produce this very remarkable exhibition. When we think of their zeal and self-sacrifice and determination, the country cannot be too grateful. And these qualities have not been confined to this country, but far beyond this island. It had been a matter of universal remark, the zeal, the determination, and friendly feeling which has been shown by men of science all over the world. We have—the Lord President and myself—done all that we could do to make this not a gazing place merely, but to give as much instruction as possible to those who desire to receive it. These Conferences will be a source of the greatest

possible gratification, old friendships will be renewed, new friendships will be created between men of science of other parts of the world. These Conferences will, we trust, be much appreciated. The examination of the collections will be much assisted by the admirable handbooks which have been prepared by men of the highest capacity. Allow me also to express my sense of the very high service which the officers of the Science Department have rendered; their zeal, their highly-cultivated intelligence, devotion of time and almost of health—we have reason to be proud of serving the Queen in concert with such officers. To the different men of science I express my hearty good wishes for exertions towards the continued success of the Exhibition. When these Conferences come to a close we shall feel that a great work has been done on behalf, not of this country only, but for the whole of the world.

The President (Mr. Spottiswoode) then delivered his inaugural address. He looked upon the Exhibition as marking a great epoch in the scientific world, inasmuch as they had gathered together a collection of instruments from all parts of the earth—instruments that were not only models of ingenuity and skilful workmanship, but also evidences of deep thought and searching intellectual labours. The present was the first serious, or, at all events, the first successful, attempt that had been made at a cosmopolitan collection of the kind. He took the opportunity of thanking the English and foreign societies and institutions that had contributed to it, and referred in detail to many of the pieces of apparatus to which attached a historical interest. A museum consisting entirely of relics of this kind, however of deep interest though it might be, was of comparatively little moment compared with one embracing the recent developments of experimental science. In contemplating the older instruments there was one point which must forcibly strike those who were accustomed to work with modern apparatus. It was the question, how did the earlier philosophers manage to achieve the results they did with the crude means at their disposal. The truth was, that in the development of a scientific theory there were several stages. There was the early dawn of its conception; the grasping of the early principles; their realization in their main outline; and their subsequent perfection by reduction to exact natural laws. It was in this last stage that the modern complicated instruments were to be regarded as of inestimable value. Frequently a complicated instrument underwent simplification in the course of its use, and this was quite natural, as our first efforts were directed to the elaboration of that which would solve the problem under consideration, and our next to the consideration whether the solution might not be effected by a more simple process. By bringing together in one place such a progressive collection as they had there they were enabled to afford the scientific man a comprehensive and vivid picture of the history of science. Before concluding, he threw out the suggestion that such of the instruments as were now of no practical use, but simply of historical interest, might be left at South Kensington on permanent loan, thus forming a valuable addition to the Museum. Many individual persons, as well as societies, might be glad to avail themselves of a safe national repository for instruments that they might possess of historical value. They had, however, collected together there not only scientific instruments, but also men whose powers had led up to their development. He would, therefore, bid them welcome, and assure them that all would listen with interest to the discourses which they would deliver on their own special subjects, on which they had expended such admirable thought and energy.

Mr. Warren de la Rue, in proposing thanks to the President, strongly expressed a hope that the collection might be the nucleus of a permanent one.

The addresses arranged for the day were then delivered as follows:—

Mr. W. Huggins, D.C.L., F.R.S., "On the present state of Spectroscopic Research relating to the Stars and Nebulæ." Mr. Huggins said he had nothing new to bring forward, but he gave a brief account of the methods employed.

Mr. Norman Lockyer, F.R.S., "On Spectroscopic Research in Solar and Molecular Physics." The name of Captain W. de W. Abney, R.E., was associated with Mr. Lockyer on the programme. The address referred to the application of photography to recording observations on the spectrum. After describing the arrangements by which photographic plates are used to receive impressions instead of the eye, some of the results obtained were referred to. A portion of the lines of spectra are being carefully mapped, and, as there seems a fair prospect of the number of observers being increased, there is hope that our knowledge will extend at a rapidly progressing rate. In passing from a solid to a gaseous state bodies give out frequently no less than five dissimilar spectra. Here is indicated a vast field for future research.

Professor Soret described "a spectroscope with a fluorescent eye-piece."

Mr. H. C. Sorby, F.R.S., spoke on the original form of spectrum microscope, and the various subsequent improvements and additional apparatus. The address was a rapid historical summary, and the spectrum eye-piece and binocular apparatus designed and exhibited by Mr. Sorby were explained.

Professor Clifton, F.R.S., spoke of interference and instruments for the measurements of optical wave lengths. He referred rapidly to the successive work of the men of science bearing on the subject and that of the undulatory theory of light, and described the apparatus he has improved and lent to the collection. Among the other results he has obtained, he quoted the observations on the wave lengths of sodium light. The mean of observations is that they are .000589 millimeters.

After an adjournment for lunch,

M. Wartmann, of Geneva, described several experiments he had made with radiometers, and did not concur in Mr. Crooke's views.

Many of the articles to be seen at South Kensington possess great historic interest as showing the crude forms in which the early pioneers of science clothed their ideas, these often standing side by side with the perfected apparatus, of the most modern and improved form or character. For here may be found, among other things, the telescopes of Galileo, Newton, Herschel, and Rosse; Stevenson's "Puffing Billy" and the engine "Rocket;" the earliest example of the marine engine; Tycho Brahe's quadrant; and the siderostats of Foucault, and how many objects of priceless value and intense interest.

The arrangement of the exhibition is one which could hardly have been improved upon; nationality is disregarded, and the objects are grouped strictly according to classes. The beneficial result of this is, that you can examine the productions of the various countries in any given branch of scientific appliances, without trouble or loss of time, so that comparative research becomes an easy matter.

The first edition of the catalogue contains 617 pages and 4576 entries under twenty-one sections, which really constitute the circle of the sciences. A handbook is also published which contains introductory notices to the several sections, prepared by English *savants* under the direction and at the request of the Lords of the Committee of Council on Education.

In a future number we shall particularize such exhibits as are connected with the various trades represented in this journal.

BELLS, CHIMES AND CARILLONS.

IN the March number of this journal we inserted a paper on bell-chiming machinery, and described the erection of such machinery (of Messrs. Lund & Blockley's system) for St. Luke's Church, at Derby.

We subsequently had the pleasure of inspecting another set of machinery, prepared by the same firm, for the church of St. Matthew's at Surbiton, and, as many details were, owing to want of space, necessarily omitted in our last description, we may with every due propriety make mention thereof in our present number. In the machinery under notice our attention was first attracted to the barrel, made of mahogany and containing 3500 small pins of hard drawn wire, that number corresponding with the same number of blows on eight bells. Passing on to the machinery itself, we next noticed a very great improvement on the old system, which is that the lifting of the hammer is done quite independently of the discharge; or, in other words, on the old plan, the pins lifted the hammer by means of the lever, and as soon as the pins in the barrel passed the line of contact with the lever, the lever fell and the blow was struck. Consequently, notwithstanding every precaution, the edge of the pins, one of the most important parts, were the first to wear. Thus while in the old style everything was attended with friction, the new system does away with all friction in the barrel, which simply discharges a catch which holds a lever, and through it the hammer ready to fall and strike its bell. Another great advantage of the machinery under notice is its being so constructed that any one part can be taken out for repair without disturbing any other, even to every lever and every catch, up to any number. The benefit of this arrangement was fully explained to us by Mr. Lund in the following remarks:—

"After machinery of the same description had been fixed at Ipswich some short time, I had left it at nine o'clock on the Saturday evening, after it had chimed the quarters and played its tune twice over, and upon my return, at nine o'clock on Sunday morning—of course you understand that I was only there to see all was

right—to my great dismay I found that the heavy rain of the night before had run through an unstopped hole in the lead floor of the bell-chamber above, and that the machinery was most carefully watered all over. Of course by Monday red rust was everywhere where I had not been able to wipe it off the day before. A workman and myself began at seven o'clock on Monday morning. It only missed striking the quarters for two hours; it played as usual each third hour, and was as free from water and rust as ever it was by six o'clock the same evening, much of the steel work having been repolished. Had it been needful to take all the machine to pieces at once, three days at least of silence would have been necessary."

After a careful examination of the entire machinery, and having been favoured with a full explanation of its many details, we clearly perceived that among its numerous advantages and improvements may be included:—Extreme simplicity of all the parts of action; lightness of all the several parts, yet perfect strength and durability; high finish and accuracy, absolute steadiness and ease of discharge, by which perfection is obtained in the music or changes, or whatever work the machinery is called upon to perform; rapidity of lift, by which multiplicity of hammers is avoided and weight saved; ease with which repair can be done to any one given part without disturbing the machine as a whole; and last, but not least, cheapness, not the cheapness which is obtained by inferiority of workmanship, but cheapness which is obtained by simplicity of action—not using three actions where one will do because our ancestors did it that way three hundred years ago, and therefore it must be right, and consequently, saving material and labour, which make the cost. After having viewed the machinery alluded to, we paid a visit to the Factory of Messrs. Lund & Blockley, which is situated in William and Mary Yard, Great Pulteney-street, Golden-square, within about two minutes' walk of Regent-circus. In the lower shop we found a forge in full blast upon the iron-work of the shop, and benches and lathes around. One lathe was capable of taking in a 3 ft. wheel. It was, also, a surfaceing and screw-cutting one, self-acting, double-headed stock, 6 ft. centres, 9 ft. bed, back gear, and an overhead motion for steam power. We also saw a smaller telescopic one, and we think two others. In the upper shop there were the requisite fitters' benches, and fuzee and wheel-cutting engines. The fuzee engine was up to the largest sized spring-going work, and seemed to be in "apple-pie order." The under-mentioned orders were in various stages of forwardness.

Six large mahogany drum-clocks, of 2 ft. 6 in. diameter; each to show thirteen different times at thirteen different places. By some persons these instruments are called "longitude" and "meridian" clocks, from their showing the hour at places according to the longitude of the place. The drum-clocks above-named will have back and front dials. The next was a small, turret time-piece to show the time on 2 ft. 6 in. illuminated bracketed dials for the Liverpool, London, and Globe Insurance Company's office at Montreal. A turret clock to show time on two 5 ft. copper dials, and strike the hours on a 12 cwt. bell, for Papworth Church. A turret clock for Hawkshead Church to show time on a 6 ft. dial; and to chime the Cambridge quarters, and strike the hours. These famous quarter chimes are at St. Mary's Church, Cambridge, from which town they derive their name, and it is said that they were invented by the well-known Dr. Crotch, in 1780, from one of Handel's melodies.

There are, also, several smaller turret clocks in course of manufacture. Among many that are ordered, two patent chiming machines are being fitted up, one for eight bells. Another machine for thirteen bells, for Mitford Church, Northumberland. This set of machinery will not only chime for all the services, but there will be several barrels of seven tunes each, and a key-board will be attached for playing the chimes by fingering. Similar key-boards are at Highbeach and Weymouth, and are very much appreciated.

We noticed the works for two large spring quarter-clocks in ebonized and gilt cases, to chime the quarters and strike the hours on eight bells. These clocks have a combined mechanical action by which the arm of a beautifully-carved ivory figure apparently strikes the hours on a bell. They are also provided with a perpetual calendar movement, by which the day of the month is given correctly for all the long and short months of the year, and the 29th of February once in four years. On the last night of every month the month is changed, the succeeding one being seen in its first day on the following morning. This principle of clock mechanism is peculiar to Messrs. Blockley and Lund, covered, we believe, by patent. It can be applied to watches as well as to clocks. The years following leap-year are also shown by a movement that takes place on the night of the 31st of December. Such a clock, whether applied to public or domestic purposes, will be a source of great utility.

CORAL.

DOINGS OF THE CORAL ANIMALCULE.

THE structures reared in tropical seas by the coral animalcule are amongst the greatest wonders of nature. That a con-gregation of creatures almost too minute to be seen by the naked eye, should be able to raise up mounds of a stone-like substance, hundreds of miles in extent, and in some places forming considerable groups of islands, seems at first so unlike all that we know of nature, that we can scarcely bring ourselves to assent to it; yet the fact is so thoroughly proved, that all doubt upon the subject has long been abandoned.

The coral animalcule, or polype, taken apart from the rocky mass which it rears, is a creature of gelatinous substance and simple structure; some species are about the size of a mite, others much smaller. It has the power of secreting from the sea carbonate of lime, which it deposits for the purpose of forming a mansion for itself. The deposits of a vast number together form the substance called coral. On any face of coral containing living animalcules, they are seen, each occupying its own small cell, with its hair-like tentacula spread out at the opening, to catch the still smaller sea-animalcules on which it lives. A thousand cells, each with its living tenants, have been counted upon a surface which a man's finger could cover. The young appear first as eggs, which, after floating about for a few days, become attached to the surface of the coral: when perfectly developed, they commence building their own cells, and quickly entomb the preceding generation. The mass thus increases in bulk, and it does so not in a random manner, but in certain forms which are in the main regularly observed. Some rise in the form of trees, shrubs, mosses, mushrooms; some bear sportive resemblances to pitchers and fingers; a particular kind form a roundish mass marked with wavy lines, like the human brain. The corals which take these comparatively small forms are found in water so much as a thousand feet in depth. Different species (Porite, Millepore, &c.) raise mound-like structures, which are often of vast extent: these are believed not to exist more than two hundred feet below the surface. They only can exist in the sea, and therefore the structure always terminates when it reaches the surface. They are found, however, carrying on their operations in surfs and breakers which would swamp a boat.

The productions of this animalcule in the Pacific and southern oceans form obstructions to navigation of so serious a nature, as to call for particular attention from the mariner. The ultimate purpose served by many of them, in the formation of dry land in the midst of the ocean, gives them also a high interest in the eyes of the geologist. They take several distinct forms, to which special names have been applied.

Those called *coral reefs* and *atolls* are submarine rocks of coral, usually ascending so near to the surface of the sea, that their existence is indicated to the navigator by breakers. They are found remote from land, are in vast numbers, and often of great extent, and generally effect an irregularly circular form, having a pool of comparatively still water in the middle, called a *lagoon*. Storms throw up masses of broken coral upon them, which accumulate to the depth of some feet above high water, forming chains of islets along the reef. The whole reef in this condition is called a "lagoon island," or more conveniently an "atoll," a word borrowed from the South-Sea Islanders. Some reefs have many islands upon them, some have few, and some have none.

A coral reef may be defined a wall or mound of coral rock, built up in the ocean from a considerable depth, and generally returning into itself, so as to form a ring, with a sheet of still water in the interior. "Every one," says Mr. Darwin, "must be struck with astonishment when he first beholds one of these vast rings of coral rock, often many leagues in diameter, here and there surmounted by a low verdant island, with dazzling white shores, bathed on the outside by the foaming breakers of the ocean, and on the inside surrounding a calm expanse of water, which, from reflection, is of a bright but pale-green colour." The wall of coral rock forming the ring is generally from a furlong to half a mile in breadth, averaging about a quarter of a mile. In one rare case it is three miles. The diameter of the atoll, or circle formed by the reef, varies from less than one mile to thirty or forty. There is one fifty miles in length by twenty in breadth; so that, if the ledge of coral rock forming the ring were extended in one line, it would be 120 miles in length. Assuming it to be a quarter of a mile in breadth, and 150 feet deep, here is a mound compared with which the walls of Babylon, the great wall of China, or the pyramids of Egypt, are but children's toys; and built, too, amidst the waves of the

ocean, and in defiance of its storms, which sweep away the most solid works of man.

The wall of coral is generally breached in one or more places; and when the breaches are deep enough to admit a ship, the atoll affords a convenient and safe harbour.

Some of the atolls are perfect circles. The external side of the reef often plunges to a depth of 200 or 300 fathoms, at an angle of forty-five degrees, or more. At Cardoo Atoll, no bottom was found with a line of 200 fathoms (1200 feet), at the distance of sixty yards from the reef. The internal side, on the other hand, shelves gradually towards the centre of the lagoon, forming a saucer-shaped cavity, the depth of which varies from one fathom to fifty. In no instances has it been found entirely filled up. Beyond the line where the coral ceases to grow, the bottom of the lagoon consists of rolled fragments of it, or a whitish mud consisting chiefly of the same substance in a comminuted state. Much of this mud is supposed to be produced by certain species of fish and molluscos animals which browse upon the coral, grinding it down to fine meal, part of which will pass from them and be deposited by the water. From this description, it will be seen that an atoll closely resembles in form the cone of a submarine volcano, the coral reef representing the rim, and the lagoon occupying precisely the place of the crater.

The islets formed on these reefs are very singular objects. In storms, the sea throws up fragments of coral, sometimes mixed with sand. The outer and lowest stratum of this matter, which is bathed by the sea at high tide, is sometimes converted into a brecciated coral rock by calcareous infiltrations from the water. Above this, and generally at the distance of 200 or 300 yards from the outer margin of the reef, the loose fragments, east up in strong gales, mixed occasionally with sand and shells, accumulate till they form a bank rising from six to twelve feet above high water, with the highest side towards the sea, from which the surface slopes inward to the lagoon. The ordinary width of these islets is under a quarter of a mile, and their length varies from a few yards to several miles. The island connected with Keeling Atoll, in south latitude twelve degrees, and east longitude ninety-six degrees fifty-four minutes, abounds in cocoa trees, sprung from nuts brought by the currents from the ocean from Sumatra or Java, six hundred miles distant. Turtles browse on the sea-weeds which grow in the lagoon. The islands are inhabited, and these two articles supply the people with food. What is singular, fresh water is obtained from wells which ebb and flow with the tides. It has been suggested that the rain water, being specifically lighter than the salt, keeps floating on its surface, and is subject to the same movements.

Barrier reefs are another form of productions of the coral animalcule; and of these many specimens are found in the Pacific and Indian Oceans. They encircle islands of primary, secondary, or volcanic rock, with only a narrow channel between. Except in being thus formed in conformity with the outline of an ordinary island, they resemble the other kind of reefs in all respects. They have scattered islets, are pierced by breaches, and their exterior sides are steep and deep, while their interior are shallow, and slope gently.

There are two very remarkable barrier reefs known. The first is that which runs along the north-east coast of Australia, 700 miles in length. It is divided from the land by a lagoon channel from ten to thirty miles broad, and from ten to sixty fathoms deep. The other runs parallel to the shores of New Caledonia for a length of 400 miles. It accompanies the shores for 250 miles, and continues for 150 miles more in the same direction, affording presumptive evidence that the island has a submarine prolongation of this extent. At some places it is but a few yards from the island; at others it is twenty miles; and so steep was its exterior side found to be in one instance, that at two ship-lengths from the reef no bottom was found with a line of 900 feet.

There are small atolls sometimes placed in elliptical rows, with a sheet of water in the centre, and thus becoming constituent parts of a large atoll. There is an example of this arrangement in the Maldiva archipelago, where the combination is carried a stage higher. This group extends over a space of 470 miles in length by fifty in breadth, and forms, as it were, three orders of atolls. First, you have 100 of these little reefs, with pools in the centre, so disposed as to form one large atoll, fifty or sixty miles long, by ten or fifteen broad, with a lagoon twenty-five fathoms deep. Next, twenty of these large atolls of the second order are arranged in the shape of a narrow ellipse, so as to form one vast atoll of the third order, 470 miles in length by fifty in breadth, with a lagoon in the interior of unfathomable depth.

It will be observed, that where any of the reefs above-described have islets, habitable or otherwise, on their surfaces, these have

been formed not by the animalcule, which cannot work above the sea, but by matters thrown up by storms, and accumulated above the coral. We are now to advert to examples of the coral mass itself being found in the character of dry and habitable land, to which, of course, it must have been transformed by the *elevating forces* recognized by geologists. Coral banks are found in most of the Sandwich Islands many yards above the sea. In one, they form three strata, each ten feet thick. In Oahu, Mr. Pierce, an intelligent European, who has lived there sixteen years, is convinced that elevation is at present going on "at a very perceptible rate." Elizabeth Island (south latitude twenty-four degrees, west longitude 129 degrees,) eighty feet high, is entirely composed of coral. Five of the "Cook and Austral" islands (south latitude twenty degrees, west longitude 160 degrees) are of coral rock. The sixth Mangaia, 300 feet high, is, with the exception of a little basalt, entirely of coral; and having a flat top with a lagoon-shaped cavity in it, is evidently an upraised atoll. Tongataboo, one of the Friendly Isles, is entirely of coral. Eoua and Vavao, in this group the former 200 or 300 feet high, are of the same substance. Anamouka, another, twenty or thirty feet high, with a salt-water lake in the middle, is, in truth, an atoll, only a very little elevated. Savage Island, forty feet high (south-east of the friendly group,) exhibits tree-shaped corals still unbroken, a proof that its elevation is recent. In the Navigators' group (south latitude fourteen degrees, west longitude 170 degrees), large fragments of coral were found on a steep hill at the height of eighty feet, imbedded in a base of decomposed lava and sand. On the New Hebrides (south latitude eighteen degrees, east longitude 168 degrees), coral, seemingly of recent origin, is found at a great altitude. New Ireland (south latitude four degrees, east longitude 153 degrees), which belongs to the Salomon group, presents beds of madrepore rock, with the corals little altered, forming a newer line of coast modelled round an ancient one. In the Mariana group (north latitude fifteen degrees, east longitude 146 degrees), a succession of cliffs of madrepore limestone present themselves. In the great circular chain of islands extending from the Bay of Bengal to Japan, embracing Sumatra, Java, Timor, Ceram, the Philippines, and Loo Choo, there are corals or beds of sea-shells at considerable heights!

Amongst all the great deeds of man, there is no instance of his forming dry land for himself in the bosom of the sea; but it is evident that this mighty feat has been accomplished, on a vast and magnificent scale, by an animal forming, in his eyes, but a mere gelatinous point. How wonderful to reflect on the greatest of labours thus effected by apparently the humblest of instruments!

The productions of the coral animalcule have not as yet been studied to any satisfactory results. How they should build mounds inclining to return into a circle, or encircling islands, and how they should form a series of the smaller circles into one larger one, are curious questions, worthy of the most careful attention of the naturalist. In the case of barrier reefs near land, it might be presumed that the condition of the sea, either as to its tranquillity or the food found in it, might be the directing agency; but no such presumption can be formed with regard to atolls. Mr. Charles Darwin, who served as naturalist in the expedition of the *Beagle*, in the years from 1832 to 1838, took advantage of his opportunities to study the coral reefs of the Pacific and Indian oceans; and, from what he observed, formed a theory that they go through a series of stages in connection with subsidences and rises of the earth's surface. He considers a reef fringing an island the first stage; then he presumes the island to sink; the coral advances till it rises in a circle round the submerged land. When the island has been fairly covered over, and the reef raised to the surface around it, an atoll is the result. In support of his theory, he particularly adverts to the fact, that the coral animalcule is not found to work below the depth of 200 feet: to account for mounds of 1000 feet depth, therefore, we must presume that the work was begun upon a bottom much nearer the surface, but which has since sunk. There are many objections to Mr. Darwin's theory, which we shall not trouble our readers with; while it seems to us that he lays too much stress on the opposite difficulty, as it is by no means improbable that the lower parts of the coral mounds are the work of a species different from that which exists near the surface. It is, however, likely, from what we know of the changes of level in the solid parts of the earth's surface, that coral reefs have sunk in some few scattered instances, as we know they must have risen in others.*

* Mr. Darwin has published an elaborate work on the Coral reefs; and this paper is to be considered as little more than an abridgment of a lengthened review of that work which appeared in the *Scotsman*.

THE NEW PATENT GALILEAN WALKING-STICK TELESCOPE.

MESSRS. COHEN, JACOB & CO., of Ely-place, have just introduced and are the sole manufacturers of the new patent Galilean walking-stick, invented and patented by Mr. Ince Hosking, of Ventnor, I.W.

The telescopic arrangement of this instrument is the same as that used by Galileo in his astronomical observations. It consists of a convex object and a concave eye-glass. For its application to all kinds of sticks and staves, viz., walking-sticks, alpine-stocks, fishing-rods, hunting or other whips, umbrellas, &c., &c., or to any kind of rod, the inventor has been granted Her Most Gracious Majesty's Royal Letters Patent.

To the tourist, the pedestrian, and to travellers every ounce of additional weight is of moment, and the patent Galilean walking-stick enables them to dispense with the ordinary cumbersome heavy telescope, or the binocular with its case and straps. This walking-stick may be converted in an instant into a powerful telescope by simply attaching the object-glass; this glass, when detached, is so portable that it may be carried in the waistcoat pocket, being, with its mounting, only an ounce and a half in weight. It is, moreover, exceedingly useful as a reading-glass; and the "matchless" smoker may light his cigar by means of its focal power.

It is a perfect "*Tria juncta in uno*." The pedestrian obtains the support which he so often requires in shape of a stick or staff, while the tourist finds the compass an almost indispensable companion, and the telescope enables the observer to gratify the eye by obtaining a correct definition of distant objects. Vessels are discernible in a clear atmosphere at a distance of 25 miles.

THE HATTON GARDEN JEWELLERY ROBBERY.

WE are pleased to hear that Messrs. Williams & Son, of Hatton Garden, the heavy sufferers by the recent extensive robbery, have made satisfactory arrangements, so that their business will continue as heretofore. Up to the present time no clue has been discovered leading to the apprehension of the thieves or restoration of any of the property, and Messrs. Williams & Son have issued the following circular:—

DEAR SIR,—The loss we suffered by robbery on the 25th March last was a great shock to us, and caused a partial suspension of our business up to this time.

We met our creditors yesterday, and they accepted a composition that was generous on their part, and they unanimously passed a vote of sympathy and of confidence in our honour and integrity; having still their support we are now enabled to resume business, which we shall do with all the energy in our power.

We shall continue to pursue our former mode of business by selling fine goods at lowest prices, and we appeal to the kind feelings of our customers to assist us under the severe loss referred to, by putting all the business they can in our way. Yours faithfully,

London, 108, Hatton Garden. May 19, 1876.

J. R. WILLIAMS & SON.

SPECTACLE-MAKERS' COMPANY.

A DINNER was given by this company on the 19th ult., the occasion of the Right Hon. G. J. Goschen, M.P., being admitted on the court of assistants. The Master, Mr. W. M'Arthur, M.P., presided, supported by the Upper Warden, Sir A. Lusk, M.P., and among the gentlemen present were the Earl of Kimberley, the Earl of Camperdown, Sir T. Bazley, M.P., Sir T. Chambers, M.P., Sir T. Dakin, Sir B. S. Phillips, Messrs. J. G. Hubbard, M.P., C. Newdegate, M.P., A. M'Arthur, M.P., G. Goldney, M.P., P. Twells, M.P., D. McLaren, M.P., J. Cowan, M.P., J. Pender, M.P., H. Birley, M.P., G. Anderson, M.P., H. Edwards, M.P., R. Davies, M.P., T. Cave, M.P., J. T. Agg-Gardner, M.P., R. H. Alexander, the renter wardens; Sir G. Airy, Vice-Admiral Sir C. Shadwell, and Colonel and Alderman Sir W. Rose. The usual loyal and several other toasts, including that of the Right Hon. G. J. Goschen, were given and duly responded to.

WONDERS OF SCIENCE.

A GRAIN OF GOLD has been found by Muncke to admit of being divided into ninety-five thousand millions of visible parts: that is, by the aid of a microscope magnifying one thousand times. A sovereign is thus capable of division into ten millions of millions of visible particles.

THE Watchmaker, Jeweller, and Silversmith,

A MONTHLY TRADE JOURNAL,

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades; published at 34, HATTON GARDEN, LONDON, E.C.

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Cheques and Post-office Orders to be made payable to A. VICTOR, at Holborn Viaduct Post Office, W.

OUR SECOND VOLUME.

IT is with great satisfaction that we commence (with the present number) the Second Volume of this journal. The considerable improvement which is evident in its pages is not the result of a day, but that of steady work from month to month since the date of our first appearance.

Representing trades which partake of the character of Arts, the WATCHMAKER, JEWELLER, AND SILVERSMITH is intended to be both an Art journal and a practical trade representative; and although we had at the commencement of the undertaking hoped that our endeavours would be appreciated, nevertheless we must express very agreeable surprise at the general, hearty, and enthusiastic manner in which our pages have been received. The many encouraging encomiums which have reached us from all quarters give us every reason to believe that we are supplying a want which really existed, and can but tend to stimulate us in our endeavours to make the journal a welcome and useful visitor in every establishment connected with the various trades which it represents. True that we cannot possibly accomplish such aims without the assistance of the trade, but the very liberal encouragement which we have so far thankfully received leads us to hope that it will not be withdrawn, but that new supporters will rally around us, and strengthen our exertions, which we assure our readers will be strenuously put forth to render the journal worthy of their support. As this early stage of our career is not a fitting time to claim credit for the little which has been effected by our unceasing labours, we can only say that to "PROMISE LITTLE AND PERFORM THE MORE" is the motto which, though not ostentatiously put forth, has yet engraven itself upon our mental tablet, regulated our past, and will govern our future career. We are proud to possess evidence that our subscribers take an interest in our labours and object, as well as appreciate our endeavour to carry out the principle which we have chosen to govern us.

New professions appear unnecessary, NEW SUBSCRIBERS will be more effective; and we therefore only venture to hope that those who are not already on our list will be enrolled WITHOUT DELAY. With the commencement of a New Volume let us have renewed support, and, with the issue of the THIRD, we trust that our readers will be enabled to recognize the aptitude of our motto, and adherence thereto.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 7d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver 4.6½d. to 4s. 8d. (variable).

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

BAND WILLIAM THOMAS, St. Butts, Coventry, watch manufacturer. Apr. 28.
GLEESON JOHN, Coldwell Street, Wirksworth, Derby, jeweller, &c., at Harrison & Co., accountants, 18 Wardwick, Derby. June 15 at 11.
HARRIS HENRY, trading as HENRY HARRIS & Co., Warston Lane, Birmingham, jewellers' factor. C. B. Hodgson, solicitor, 13 Waterloo Street, Birmingham.
IRELAND HENRY, 31 Smithford Street, Coventry, watchmaker, at C.C., 17 Little Park Street, Coventry. June 12 at 2.
MILES and JAMES FREDERICK SPOUN, 33 Aldersgate Street, jewellers and fancy goods importers. May 4. Lumley and Lumley, 15 Old Jewry Chambers.
PAULIN ELIZABETH, trading as Alexander Swinney, Morpeth, Northumberland, ironmonger and jeweller, at Thomas Nicholson, solicitor, Bridge Street, Morpeth. June 9 at 3.
SCHAWLOW COLMAN, Church Street, Cardiff, tobacconist, jeweller and furniture-dealer. Apr. 28. D. W. Davies, solicitor, 11 St. John Street, Cardiff.
WHITEHALL EDWIN, Commercial Street, Newport, jeweller. May 6.
SHAW JAMES, Cheapside, Leicester, watchmaker and jeweller. Fowler, Smith & Warwick, solicitors, Leicester.
KYEZOR BARON ISAAC, 11 Charterhouse Buildings, Goswell Road, optician and importer. May 8. Treherne & Wolferstern, solicitors, 20 Ironmonger Lane.
O'CONNOR JAMES W. B., commonly called JAMES WILLIAM CONNOR, Treorky, Ystradgwydw, Glam, jeweller. May 4. Hollier & Williams, solicitors, Pontypridd, Glam.
WEATHERHILT SAM PRATT, trading as S. P. WEATHERHILT & Co., Boldmere Road, and Lower Loveday Street, Birmingham, and Bond Street, Coventry, jeweller. May 9. W. Fallows, solicitor, 12 Cherry Street, Birmingham.
DODWELL MATHEW, Hertford Terrace, Coventry, watch and jewel manufacturer. May 11. Edwin Jaques, solicitor, 40 Cherry Street, Birmingham.
ELWIG DANIEL, St. Ives, Hants, watchmaker and jeweller. May 15. G. N. Day, solicitor, St. Ives.
LEVY DAVID, Middlesborough, jeweller. May 18. J. W. Teale, solicitor, 13 Albert Road, Middlesborough.
OWSTON JOHN, Keighley, watchmaker and jeweller. May 19. Robinson & Robinson, solicitors, Keighley, June 9 at 2.
SMITH WALTER F., Lincoln, watchmaker. May 16. W. T. Page, jun., solicitor, Flaxengate, Lincoln.
TACKER DAVID, Bridge Street, Carmarthen, watchmaker and grocer. May 17. W. D. Evans, solicitor, Queen Street, Carmarthen.

Dissolutions of Partnership.

HANCOCKS & Co., Bruton Street and New Bond Street, jewellers. Apr. 12. As regards Charles F. Hancock, jun.
RUTLEDGE RICHARD and EDWIN BAKER, under the style or firm of Rutledge & Baker, 23 George Street, and 53 Buckingham Street, Birmingham. Electro-platers. As regards Edwin Baker. May 23.

Adjudications of Bankruptcy.

MICHAEL James, Soho Hill, Handsworth, Staffs, jewellery factor. May 1.

Trustees Appointed.

BURY JOHN H. (Liq), Bury, jeweller. Trustees, Edwin B. Harding, Brown Street, Manchester, accountant, and Thomas Whitehead, Bury, auctioneer.
BARNET THOMAS H. (Liq), Winterton, Lincolnshire, watchmaker. Trustee, Benno Cohen, 5 Mytongate, Hull, jeweller.
LEON HERNTZ (Bkt), Bath, jeweller. Trustee, William Prior, 9 Somerset-buildings, Bath, accountant.

Discharges Granted and Bankruptcies Closed.

SAMUEL JOSEPH SIMON (Bkt 1853), 67 Hatton Garden, watch manufacturer. Certificate allowed Mar. 3.

Bankruptcies Annulled.

GENESE SAMUEL (Feb. 22), Dalby Street, Liverpool, jeweller. May 19.

Scotch Sequestrations.

BARNETT JOHN, Argyle Arcade, Glasgow, jeweller. Apr. 26.
KNOX J. W., 51 West Regent Street, Glasgow, writer. Agent.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

2008. HENRY YARNLEY, of Birmingham, in the county of Warwick, Manufacturing Jeweller, for an invention of "An improved catch or clasp, applicable as a fastening for solitaires, books, purses, and other articles of a like or similar nature."—Dated 13th May, 1876.
2075. JOHANN ERNST FRIEDRICH LÜDEKE, of 6, St. Benets Place, Gracechurch Street, in the city of London, for an invention of "A new self-renewing movement or power for clocks and watches, and other useful purposes."—Dated 17th May, 1876.
2119. JAMES CARPENTER and GEORGE MARTIN, of St. John Street, Road, Clerkenwell, in the county of Middlesex, and of Tooting, in the county of Surrey, Clock Manufacturers, for an invention of "Improvements in clocks or similar-time keepers."—Dated 19th May, 1876.

Grants of Provisional Protection for Six Months.

1528. To WILLIAM HENRY ALFORD, of Ventnor, Isle of Wight, in the county of Hants, for the invention of "Improvements applicable to finger rings, bracelets, and other similar articles."
1529. To JOHN COMPTON WEEKS JEFFERYS, of 14, Tottenham Court Road, in the county of Middlesex, Manufacturing Jeweller for the invention of "Improvements in scarf-rings and other like dress fastenings and ornaments."

Notices to Proceed.

839. JOHN GEORGE HENRY HOCH, of 283, Brixton Road, Brixton, in the county of Surrey, Watch and Clock Manufacturer, "An improved system of public and other clocks."
891. WILLIAM WHITTLE, of Smethwick, in the county of Stafford, Engineer, and JAMES NEWMAN, of Small Heath, near Birmingham, in the county of Warwick, Jeweller, have given the like notice in respect of the invention of "Improvements in coating with metals light articles composed of metal, such as nails, screws, tacks, and other similar small wares, as well as the light parts of machines, as also in the machinery, apparatus, or appliances for effecting the same."

Patents on which the Stamp Duty of £50 has been Paid, and Dates of their Production for Certificate.

1736. ALEXANDER PARKES, of Gravelly Hill, near Birmingham, for an invention of "Improvements in the manufacture of metallic alloys."—Dated 13th May, 1873.
1846. SAMUEL CHATWOOD, of the Lancashire Safe and Lock Works, Bolton, in the county of Lancaster, for an invention of "Improvements in safes and chambers for storing valuables."—Dated 21st May, 1873.

Patents which have become Void.

1624. HERBERT ASPINALL, of 107, Oldham Street, Manchester, in the county of Lancaster, Watchmaker, for an invention of "Improvements in watches and chronometers."—Dated 5th May, 1873.

Re-issues.

6924. HENRY J. DAVIES, of Brooklyn, N. Y., for "Clock-cases."—Patent No. 161,211, dated 23rd March, 1875.—Application filed 31st January, 1876.

Patents Granted in Foreign States.

FRANCE.

- 108,069. QUINCHÉ, for "A remontoir toy watch."—Dated 27th September, 1875.
- 109,431. ROBERT, for "Insulating supports for crystal dials in mysterious clocks."—Dated 29th September, 1875.
- 109,058. LOURDELET for "Improvements in pendulum clocks."—Dated 14th October, 1875.
- 109,840. CROZET, for "Improvements in remontoir movements of watches."—Dated 8th October, 1875.
- 109,916. LEMIRE and GEGUELDRE, for "A bracelet with a parasol carrier."—Dated 12th October, 1875.
- 109,951. GUAY-LEBRUN, for "Double studs for cuffs."—Dated 13th October, 1875.
- 109,970. CATRIN, for "Gilding, silvering, or metallizing."—Dated 18th October, 1875.
- 109,988. MARIN-CUDRAZ, of Paris, for "Various systems of studs of cuffs with a watch and perpetual calendar."—Dated 18th October, 1875.
- 110,003. CHRISTIAN, for "Crystal watch-cases."—Dated 22nd October, 1875.
- 110,100. BERGER and PELLERIN, of Paris, "Animated Jewellery."—Dated 29th October, 1875.

- 110,115. MOCHE, for "Improvements in chain-fasteners."—Dated 28th October, 1875.
- 110,134. BOILLLOT, for "Calibres for watch-motion."—Dated 8th November, 1875.
- 110,204. DESURY, of Vannes, for "Applying the ocean jet of the bay of Roguedas, near Vannes, to jewellery in general."—Dated 19th November, 1875.
- 110,281. MARGAINE, for "Applying a remontoir with equal constant power to the circular escapements of travelling timepieces."—Dated 10th November, 1875.
- 110,302. CLAVEL-FIGARD, for "Improvements in the manufacture of tortois for jewellery articles, &c."—Dated 15th November, 1875.
- 110,355. RUCH, of Paris, for "Extracting the precious metals contained in ingots, ores, in matt, gold-ashes, waste and residues of amalgamation."—Dated 16th November, 1875.
- 110,448. NEUMANN, of Paris, for "A safe."—Dated 23rd November, 1875.
- 110,497. BOURDON, of Paris, for "Opera-glasses with movable object-glasses."—Dated 29th November, 1875.
- 110,511. LODS, of Paris, for "Improvements in the spring-boxes of motions of watches, clocks, &c."—Dated 29th November, 1875.

(Certificates of addition.)

- 106,026. MALFAIT, for "Clocks with pendulum motion."—Dated 30th October, 1875.
- 108,377. RICHARD, for "Improvements in the construction of metallic barometers, manometers, and thermometers."—Dated 29th November, 1875.

BELGIUM.

- 39,203. H. D. STOVER, for an imported invention of "An improved machine for cutting diamonds and other precious stones."—Dated 28th March, 1876.—(French Patent, 27th March, 1876.)
- 39,275. H. ALEXANDRE, of Liege, for "A lock for safes."—Dated 5th April, 1876.

AUSTRIA.

53. J. KRIWECZYK, of Vienna, for "Obtaining sets of teeth of gold and silver without soldering."—1 year.—(Secret.)—Dated 23rd December, 1875.
97. B. SIEGER, of Vienna, for "Giving printed materials the appearance of ivory."—1 year.—(Secret.)—Dated 29th December, 1875.

KINGDOM OF ITALY.

20. E. G. GONDOLLO, of Paris, for "Improvements in electric clocks."—6 years.—Dated 12th October, 1875.
62. G. CASPANI, of Milan, for "A clock and index for public carriages."—6 years.—Dated 21st October, 1875.
104. A. H. POTTER, of Chicago, for "Improvements in clocks and similar timepieces."—6 years.—Dated 14th December, 1875.

UNITED STATES.

9005. ROBERT B. ESLEK, of Philadelphia, Pa., for "A watch-charm."—Application filed 29th September, 1875.—Term of patent 7 years.
9008. HERMANN J. MULLER, of New York, N. Y., for "Clock-cases."—Application filed 5th February, 1876.—Term of patent 3½ years.
- 173,531. SHUBAEL COTTLE, of New York, N. Y., for "Ornamental links for necklace-chains."—Application filed 27th December, 1875.
- 173,572. RANDAL T. ANDREWS, of Thomaston, Conn., assignor to the Seth Thomas Clock Company, of the same place, for "Calendar-clocks."—Application filed 22nd January, 1876.—*Brief*.—"The calendar movements are operated by spring levers of peculiar construction, which are engaged with the different wheels, and released therefrom by the action of pins placed upon vibrating levers moved by the clock-work."
- 173,585. W. T. CARROLL, of Worcester, Mass., for "Spinning-rings."—Application filed 5th August, 1875.—*Brief*.—"A spinning-ring having its interior commencing at or near the under side of the race, and extending to the base of the ring-shank, tapered, making a circular opening, which decreases gradually in size from at or near the under side of the race to the bottom of the shank."
- 173,638. SAMUEL HUGHES, of Charleston, S. C., for "Packing-rings."—Application filed 14th January, 1876.—*Brief*.—"The wearing-ring protects the cup-packing, and may be readily and cheaply replaced."

Patents granted in British Colonies and Dependencies.

VICTORIA.

2188. HENRY ROSALES, of Walhalla, Mining Engineer, for an invention of "An improved process of extracting gold from pyrites."—Dated 14th March, 1876.

Patents Sealed.

4130. WILLIAM FORD STANLEY, of Great Turnstile, Holborn, in the county of Middlesex, for an invention of "Improved machines or clocks to register conditions of the atmosphere, and to keep correct time."—Dated 29th November, 1875.

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HORLOGY.

(Continued.)

XIV.—DIALLING.

THE union between horology and astronomy is so close that in dealing with the scientific principles of the one we are obliged to enter upon the domain of the other in order to be properly understood. Let us put a question. What is horology? The best answer that we can give in this sense is, that horology in its practical life is the mechanical demonstration of certain astronomical action. This answer might readily be amplified, or reduced to a more strictly logical form; but that would encumber the student with strange expressions which might jar upon his "common sense." The old eight-day cased hall clocks pointed in the direction of mechanical astronomy for the enlightenment of the family circle. We all recollect the jolly farmer-looking face of the sun, and the equally happy motherly-faced moon, as the pair rose and set, and set and rose in their firmament above the grand and noble dial.

Cunning clockmakers have still further improved upon this homely astronomical clock mechanism, until the almost absolutely perfect has been reached; we shall deal with them when we come to that part of our subject, in the meantime we will return to our dialling.

We recently gave the method (and the reasons upon which it was based) of drawing a vertical declining dial trigonometrically; we will now follow that on with the next in order, thus:—

To describe a vertical dial, declining from the south to the east or west, geometrically.

In our last number we explained the meaning of declination, and

the great circles of the sphere in their relation to horology. We have again occasion to refer to them before we can go any further; we also mentioned the "declinator," and this is the proper time and the proper place to explain what the last-named instrument is. We will take this opportunity of stating that the facts which we are conveying of the astral-horological kind will be found a useful and elevating addition to the reader's stock of general information, what we may call solid knowledge. Taking, then, that declination in astral-dialling is the distance of the sun from the equator, either northward or southward, this leads us to the declination of a plane or wall in dialling. This is an arc of the horizon comprehended either between the plane and the prime vertical circle, if we account it from east to west, or between the meridian and the plane, if we take it from north to south. There are many ways given by mathematicians for working out the declination of planes; but, perhaps, the handiest of all, and the most practical, is by a simple instrument called a declinator; declination, inclination, and reclination can be determined by it. It is constructed in the following manner:—

Take a square wooden board of about 12 inches on the line, and mark the angles $\frac{BC}{AD}$; and between A and D describe a semicircle that shall take up the space on the board. Next divide the upper line BC into equal parts at E. This makes two quadrants of the semicircle. Divide these quadrants into 90 degrees, each beginning from E for each quadrant. On AD, the lower line of the board, mark the quadrantal line as F, put a pin in the centre F, and fix a movable wooden ruler upon it, with a small box-compass attached to the free end.

To take the declination of a plane. Place the side of the board, which has now become the declinator, AD, to the side of the proposed plane, say the wall of the house, for instance; then move the

ruler with the compass steadily backwards and forwards, this way and that, about the centre F, until the needle rests upon the line of the magnetical meridian of the place. Now, when this has been done, mark when the ruler is resting on the magnetical meridian, as before said, and cuts the quadrant in E, then the plane is either northern or southern. If it cuts between D and E the plane declines to the west; or if between A and E, it declines to the east; the quantity of the angle will be what is formed by the diameter F E, and the movable rod. So much for taking the declination of a plane.

We next turn to take the inclinations and reclinations of planes. For this purpose we have to slightly alter the instrument. Instead of the ruler and the compass-needle, we remove them and fit on a thread at F, having a plummet at the loose end. We then apply the side B C of the declinator to the wall, or plane, for our measurement. If the plumb-line cuts the semicircle in the point E, it is quite evident that the plane [is horizontal, the line neither going to the right nor to the left; but, on the other hand, if it cuts the quadrant at any point between the centre and the extreme angle, that will be the angle of inclination; which angle can be determined by the degrees on the board. Furthermore, if we apply the side A B to the plane again, and the plumb-line cuts E, then the plane is vertical. From this it will be seen that, if the quantity of the angle of inclination be compared with the elevation of the pole and equator, it is easily known whether the plane be inclined or reclined.

The inclination of a plane in dialling is the arc of a vertical circle, perpendicular to the plane and the horizon, and intercepted between them. Here is another way to find the inclination of a plane. Take a quadrant and apply its side to the side of a square, at the same time applying the other side of a square to a plane. If the plummet falls parallel to the side of the square, then the lower side of the square stands level; at that point draw a horizontal line, upon which erect a perpendicular, and apply the square to the perpendicular. If the plummet now falls parallel to the side of the square, then that is also a level line, and the plane stands horizontally. If the plummet does not fall parallel to the side of the square, even the square, as in the first-named method, until it does. Then draw a perpendicular, to which apply the square, and observe what angle the plummet makes on the quadrant with the side of the square. That is the angle of the inclination of the plane. There is, also, a method of taking the declination of a wall by a magnetic compass, pure and simple; and it is this:—Apply that side of the compass upon which the north is marked along the side of the wall; the number of degrees over which the north end of the needle fixes will be the declination of the wall, and on that side. If the north point of the needle tends towards the north, that wall will have the sun at noon; whatever number of degrees it goes, either east or west, the compass can be made to show them. Having now described what a declinator is, we will next proceed to show how it applies to further dialling.

Let it be sought to describe a vertical dial, declining from the south to the east or west, geometrically, as contra-distinguished from the trigonometrical way.

First of all find the declination of the plane by means of the declinator, which has been just explained; then draw upon it a horizontal dial, according to instructions that have already been given, taking care to use suitable drawing-paper. Make a horizontal line, which we will suppose to be the line of contingency of the horizontal with the equinoctial plane, and mark it G—H. Upon this line we will find a meridian, and mark it A E. Through the point where it cuts the horizontal line at E draw an oblique line above G on the left hand, and below H on the right, this line to have such an inclination that it will make an angle with G H equal to the declination of the given plane. This line we will mark as I at the upper extremity and K at the lower; the angle H E K will be equal to the declination of the given plane. From this it follows that, as G H represents the intersection of the prime vertical with the horizon, I K will be the intersection of the inclining plane and the horizon. If the given plane decline to the west, the part of the line I E must be raised above G E; on the contrary, it must be depressed below the same G E, should it decline to the east. We have next to draw a right line parallel to the given plane, or wall, as a duplicate of I K. Now, assuming a point in that line to answer to the point E of the meridian that cuts the horizontal line G H, then set off on the drawing-paper from the right line, I K, the requisite hour-lines, &c., as has been previously explained. Now from the point E draw a perpendicular, E C, equal to the distance of the centre of the horizontal dial from its line of contingency. Draw other lines thence to the several points of the hour-lines, and let fall a perpendicular, A D, from the centre of the horizontal dial A, to the line of contingency, I K, and transfer the distance E D from the point E upon the wall. Having done this,

C D will be the substylar line. We will now take the line A D C, and make a right angle of D C; the hypotenuse of this right angle, or line from A to C, will be an oblique index which can be made to be fastened on the wall at the point C, according to the angle D C A. And that is how to draw a vertical dial, declining from the south to the east or west, in a geometrical manner.

To draw a vertical dial declining from the north towards the east and west. Take the declination of the plane, as previously laid down, bearing in mind that north dials are only south dials inverted. Next draw a vertical dial declining from the south, and invert it so that the centre, C, before mentioned, looks to the horizon, and the point E to the zenith. Let the hours on the right hand be set off towards the left, and also contrariwise, taking care to omit those hour-lines which in such a dial could not be properly shown. A very easy, practical way is, after drawing a south declining dial upon paper, to prick the points required upon it with a pin. Having done this, attach the face of the paper to the wall against which the dial has to be fixed; the pricked points on this side will then show all the necessary points for a north declining dial.

We must leave this part for the present and return again to some further elementary explanation of the circle, which will serve to supplement what we said upon the subject in our last.

The reader having been informed of the nature of the great astronomical circles, we do not think that we can now perform a better work than in explaining the way in which they are used for measuring purposes, all which purposes are closely connected with the higher horology.

A circle has a centre, a diameter, a radius, and a circumference. That which the circumference encloses is called the *area*. Any straight line from the centre to the circumference is called a radius, whilst a continuation through the centre—or perhaps, more plainly speaking, any straight line from one part of the circumference to the opposite part that cuts through the centre, is called a diameter, from *dia*, through, and *metron*, a measure; that is, that it cuts the area of the circle through in a measured form. From this it will be seen that two radii make one diameter. Any portion of the circumference is called an arc. It may be said, "Everybody knows that." That may be true within certain limits; but in treating of the properties of a geometrical figure that plays so important a part, not only in astral-horology, but in horological mechanism, the student must carry on his reasoning from first principles, or he will inevitably arrive at what will be understood as a "slip-slop" conclusion.

"We have often to consider," says Arago, "especially in astronomy, not only entire circles, but portions of a circle which have received distinctive names." We will explain these names and their functions in our next.

CORRECT PUBLIC CLOCKS.

PROFESSOR GRANT has addressed a long and interesting letter to the Lord Provost of Glasgow respecting the transmission of correct time from the Glasgow Observatory to the City and Port. At the conclusion of the Professor's letter, which is written with the object of inducing the Town Council of Glasgow to contribute to the maintenance of what is acknowledged to be a great boon to the inhabitants, he says—

"I shall conclude this communication with a brief reference to what Liverpool has done with a view to the dissemination of correct time. Like other advancing communities, this town is frequently in the habit of applying to Parliament for its sanction to Bills relating to the commerce of the port.

"On one of such occasions, while the Bill was passing through the House of Commons, a clause was inserted to the effect that, inasmuch as the determination of correct time is a matter of primary importance for maritime purposes, the Mersey Dock and Harbour Board should be held bound to establish an observatory adequately endowed and provided with instruments suitable to be employed for effecting this object. This occurred somewhat more than 30 years ago. The authorities of the Port of Liverpool loyally responded to the wishes of the Legislature. A commodious observatory was built on the north bank of the Mersey, which was equipped with magnificent instruments, and presided over by a director and a staff of assistants. About five or six years ago, when the extension of the commerce of the port rendered it necessary that the Observatory should be removed to the other side of the river, a new observatory, with a dwelling-house for the director attached to it, was built at the expense of 15,000*l*. This is the way in which the great Port of Liverpool shows its appreciation of correct time."

MIRROR OF THE MONTH.

JULY.

THIS month was originally called, by the ROMANS, *Quintilis*, from the Latin word *quinque*, five, because it was the fifth month in the year before NUMA added January and February. It afterwards received the name of *Julius* (hence July), in honour of Julius Cæsar.

The Saxons called July *Hen-monath*, signifying *leafy-month*, or *foliage-month*, the Saxon word *hen*, and the German *hain*, meaning wood or trees. They also called it *Hey-monath* or *Hay-month*, because in July they generally made their hay harvest.

The principal days of dedication in the modern English calendar in this month are the 15th, in honour of St. Swithin, a bishop of Winchester in the ninth century, and the 25th, consecrated to the memory of the apostle, *St. James the Great*.

St. Swithin first put on the monastic habit in the old monastery at Winchester. He was of noble parentage, and passed his youth in the study of grammar, philosophy, and the Scriptures. Swithin was promoted to holy orders by Helmstan, Bishop of Winchester, at whose death, in 852, King Ethelwolf granted him the see. In this he continued eleven years, and died in 868.

St. James, surnamed the *Great*, or the Elder, to distinguish him from *James the Less*, or Younger, was a native of Galilee, and left his property to follow Christ. Of his ardent zeal no other proof is necessary than his becoming the victim of *Herod Agrippa*. The Spaniards esteem him their tutelar saint.

July brings summer to the full. It is generally accounted the hottest month of the year. The excessive heat of this month frequently occasions an evaporation, something like steam, only not so visible, from the surface of the earth and waters, which forms into clouds, and afterwards falls again to the earth as rain. These summer storms are generally accompanied by thunder and lightning, and, from the almost constant process which is going on during the heat of July, they are usually very frequent and heavy, and often deluge the country with excessive floods.

ROYAL ASTRONOMICAL SOCIETY.

THE June meeting of this society was held at Burlington House on Friday, the 9th ult. Wm. Huggins, Esq., D.C.L., President, in the chair.

Mr. Brett read a short paper upon the proper motion of some bright spots which he had observed upon Jupiter.

The following candidates were elected Fellows of the society:—Andrew Ainslie Common, Esq., of 37, Eaton-rise, Ealing; James Love, Esq., 8, Talbot Lodge, Bickerton-road, Upper Holloway.

Seventy-six presents were announced, amongst them a box of letters which had been received from the nephew of the late Mr. Sheepshanks, who was for many years secretary of the society, and a diligent correspondent of many distinguished European astronomers.

Dr. Mann was called upon to give a verbal account of a comparison which he had instituted between the performance of a $3\frac{1}{2}$ -inch achromatic, by Ross, and a $6\frac{1}{2}$ -inch silver-on-glass reflector, by With. It appeared that the comparison had only been made as to the definition of objects upon the moon. Dr. Mann was of opinion that he could see nothing with the $6\frac{1}{2}$ -inch reflector that he could not also see with the refractor, and that the shadows of objects as seen with the refractor were distinctly blacker than those seen with the reflector, which he described as being all of a neutral tint.

Mr. Wentworth Erck said that he had had an opportunity of comparing two telescopes of nearly the same aperture—namely, a 9-inch reflector and a $7\frac{1}{2}$ -inch refractor. He could corroborate Dr. Mann's statement as to the greater darkness of the field in the case of the refractor than in the case of the reflector. The reflector, however, gave smaller and sharper discs for stars, and consequently was better suited for separating minute double stars.

The Astronomer Royal said that he had the good fortune some years ago to test one of Cauchoix's great reflecting telescopes at the Paris Observatory. It was necessary, in order to make it perform well, to blow up a bag of air in the cell behind the reflector, but when the air was blown in so as to give a proper tension to the speculum, the definition was better than that of any other instrument he had ever seen. There was no doubt that in the reflector there was only the geometrical condition of one surface to consider, while in the refractor there were four surfaces, and also the irrationality of the dispersion of the two glasses, which could never be made properly to balance one another.

Mr. Dunkin read a paper by Professor Simon Newcomb, "On a hitherto Unnoticed Apparent Inequality in the Longitude of the Moon." Lord Lindsay exhibited an adaptation to the ordinary alizimuth instrument designed to give a rough equatorial motion.

Mr. Plummer read a paper on photometric experiments upon the light of Venus.

Captain Noble read a note on the alleged specular reflection from the body of Venus.

AN EXPLANATION OF THE PRINCIPAL TERMS
MADE USE OF IN ASTRONOMY.

Æra, a series of years commencing from a certain fixed point of time, called an *Epoch*. Thus the Christian *Æra* is the number of years since the birth of Christ.

Obs.—Authors, however, generally use the terms *Æra* and *Epoch* synonymously for the time from which the computation commences.

Altitude signifies the height of the sun, moon, or stars above the horizon, reckoned upon a vertical circle, in degrees, minutes, &c.: in other words, it is the arch of a vertical circle intercepted between the stars and the horizon; also the elevation of any of the heavenly bodies above the horizon.

Amphiscii, a name given to the inhabitants of the torrid zone on account of their shadows falling at one time of the year towards the north, and at another time towards the south.

Amplitude is an arc of the horizon contained between the east or west point of the heavens and the centre of the sun, star, or planet, at the time of its rising or setting.

Angle, the inclination or opening of two lines meeting in a point.

Anteci, a name given to those inhabitants of the earth who live under the same meridian and at equal distances from the equator, but on opposite sides of it.

Antipodes, those inhabitants who live on contrary sides of the globe with their feet directly opposite to ours, being those who walk feet to feet.

Aphelion is that point in the orbit of a planet in which it is at its greatest distance from the sun.

Aquarius, a sign of the zodiac, containing ninety-three stars.

Armillary Sphere is an instrument composed of the principal circles which are usually drawn upon an artificial globe.

Aries, the *Ram*, a sign of the zodiac comprising forty-six stars, into which the sun enters about the 20th of March, or the beginning of the spring quarter.

Asci, the inhabitants of the torrid zone, so called because the sun being twice a year in their zenith, their bodies at those times cast no shadows.

Atmosphere is that collection of vapours or body of air which surrounds or encompasses the earth.

Attraction is that property of matter by which bodies are made to approach each other without any sensible agent either drawing or impelling them. It may be divided into the *attraction of gravity* and the *attraction of cohesion*.

Attraction of Gravity is that by which all bodies tend towards the centre, or act on each other at a distance. From hence proceed almost all the motions and changes in the system. It is by this principle that light bodies ascend, that projectiles are regulated in their courses, the vapours ascend, and the rain falls, the waves roll, the air presses, and the sea is swelled or decreased by the vicissitudes of its flux and reflux.

The Attraction of Cohesion is that which unites the insensible particles of bodies together into their different masses, and causes the roundness we see in drops of water or quicksilver.

Aurora, the morning twilight, which begins to appear when the sun is about 18 degrees below the horizon.

Aurora Borealis is an extraordinary meteor or luminous appearance, showing itself in the night in the northern parts of the heavens. Various reasons have been given by philosophers for this phenomenon, but as no two of them agree, and perhaps are all mistaken as to the real cause, we shall not trouble the reader with their conjectures. It is very common in countries near the pole, but rarely in England, none being recorded in our annals from Nov. 14, 1574, till the surprising one of March 6, 1716, since which time, however, they have been more frequent.

Azimuths are great circles which pass through the zenith and nadir, and are perpendicular to the horizon. The azimuth of any celestial object is an arc of the horizon contained between the east or west point of the heavens, and a vertical circle passing through the centre of that object.

(To be continued.)

METAL-WORK AMONG THE HINDOOS.

BY DR. ALEXANDER HUNTER.

THE arts of working in gold, silver, copper, bronze, brass, bidryware, koofgarree, enamel, bell-metal, zinc, steel, and iron, have long been practised in India; and in some districts of the country, where these Art-manufacturers have been encouraged, they are brought to great perfection; while in others we find them still in their primitive and almost rude simplicity, but characterized by local peculiarities and tastes, which give to some of them an artistic value somewhat akin to the bronze and metal works of Japan and China; though they far surpass most of the manufactures of these countries, and evince a thorough acquaintance with both the theory and practice of geometry, the principles and applications of design, the selection and arrangement of patterns particularly adapted for filling spaces, as well as those suited for peculiar works in metal. In addition to these important qualities, the productions in mixed metals in India evince a taste in the harmony of colours, and a knowledge of the chemistry of metals, and salts of metals, that surprise European manufacturers, and prove that different races, though apparently behind in what is called the onward march of European civilization, have still attained to various degrees of excellence, more especially to a freedom of drawing and to manipulative dexterity which have escaped detection or appreciation amongst refined or highly civilized nations. As several of the processes of manufacture are peculiar to India, and the principles of the chemistry of metals are thoroughly well understood nearly all over India, it may not be out of place to call the attention of our manufacturers to one or two points to which great importance is attached by the Hindoos. The first of these is a knowledge of free, bold, linear drawing, and the early acquisition of the power to draw clear outlines. This art is taught in most parts of southern India by the females, who commence teaching their children to draw either on sand or on a mud floor, which is washed daily; when the children are older they draw on a black wooden board, the colour of which is renovated in a cheap way about once a fortnight, with lamp black and the mucilaginous juice of the fruit of the briony, *Coccinea Indica*, or *Covei codei* (Tam.), or the juice of the flowers of the shoe-plant, *Hibiscus sabbdariffa*. It may not be generally known that this flower, if rubbed upon white paper, produces a most useful substitute for litmus paper, a very delicate test for acidity in solutions, and that the flowers of several species of *Hibiscus* give a good shining polish to boots or shoes; hence the common name of shoe-plant. Several coloured flowers are employed in the same way to produce chemical test-papers, or tinted surfaces for ornamentation. The fresh flower is rubbed on white paper till the juice exudes, and thus in a few minutes a most delicate test-paper is produced, or a tinted surface of varied gradations can be made, and by combining different flowers mixed tints are the result. In this simple way a considerable knowledge of the chemistry of flowers, leaves and fruits of plants, has been acquired; and we shall have occasion to refer hereafter to the chemical uses of several plants in some of these descriptions of manufactures in metals. Another important branch of education which is entrusted to the females of southern India are the rudiments of arithmetic and practical geometry, with the principles of colour, derived from flowers, coloured earths, and cheap substances, that can be applied to floor or wall decoration. Although these do not come under our consideration at present, I must make a slight allusion to them, as the patterns from which the forms of some of the most elegant manufactures in metals are taken can generally be traced to flowers, fruits, or seeds; and the punches, or steel tools, used in their ornamentation are almost invariably suggested by some parts of the same plant or flower which suggests the design.

It is not known with any certainty when works in the precious metals were first manufactured in India. Some of the ornaments in gold and silver which have been found in old tombs, accompanied by beads, necklaces of cut carnelian, agate, rock crystal, and felspar, have been enclosed in cinerary urns with calcined bones and teeth; these are believed to be upwards of two thousand years old; but there are others dating a few centuries after the Christian era which bear a striking similarity to the Etruscan and Grecian periods of Art, and are accompanied by manufactures in bronze and pottery very like those discovered in Herculaneum, Pompeii, and Etruria. During the early Buddhist periods, or from 2400 years down to the third century of the Christian era, it is supposed that the arts of Greece and Rome found their way to India; and at a subsequent period the son of one of the Roman emperors, who was banished for his licentious profligacy, visited Cambodia, and took with him skilled carvers, sculptors, and workers in precious metals. It is

probable, that India could boast of efficient workmen of her own training even before these periods. Many of the oldest ornaments in gold found in the tombs, cairns, cromlechs, and kistvaens evince a considerable amount of skill in manipulation and taste in design. The best of these were recently discovered in the Salem, Coimbatore, and Mysore territories, and on the Neilgherries.

One point that seems always to have been insisted upon by the gold and silver-smiths in India, is the selection of pure, unalloyed metals. This seems to simplify and expedite the process of manufacture, and probably accounts for the delicacy of the workmanship, as pure metals are more ductile than alloys.

The finest gold filigree work of southern India is manufactured at Trichinopoly, and is remarkable for the delicacy and intricacy of its workmanship. There are four or five varieties of rose pattern, and three or four of snake-pattern chains; the latter are very delicate, fine in texture, singularly pliant, and remarkably good imitations of real snakes. The rose-patterns are more elaborate in appearance, though not actually so difficult to manufacture. The process appears very simple, and the tools employed consist of a few fine steel hammers, fine pincers, a few blow-pipes, two or three highly-polished steel anvils, a burnisher, steel-scraper, a pair of fine compasses, and delicate scales and weights. So particular are the workmen about the purity of the metals, that they refine their gold or silver five times, by melting under a strong blast heat, before commencing to work with it. They are also very particular about the surfaces of their hammer and anvil being very highly polished and burnished. The work is commenced by beating the metal into thin plates nearly uniform, cutting these into long strips, and drawing them into very fine wire, by passing through perforated steel plates, with a pair of strong steel pincers. The holes in these steel plates are carefully punched of graduated sizes, and are drilled of a circular form; the plate is then tempered, or case-hardened, and strongly hammered on both sides, till quite cold, the holes being frequently re-drilled and hammered. The plates are very strong and heavy, from six to eight inches long, two or three broad, and about two-thirds of an inch in thickness. They are firmly secured in a strong bench-vice, and the wire is drawn through them while the metal is kept heated by a blow-pipe. After the wire is drawn, most of the dexterity of manipulation, and the beauty of the patterns, depend upon the practical skill of the artisans, who, for the most part, work from memory, and without any pattern before them, although most of the native jewellers have books containing a variety of patterns; the beauty of these depends chiefly upon delicate workmanship, or on curious and original combinations.

The localities where the best and most tasteful work is produced are Trichinopoly, Cuttack, Travancore, Vizianagram and Delhi. This manufacture is very similar to the filigree-works of Malta, Genoa, Paris, Florence and London; but it is finer in India, and cheaper. Some varieties, in which burnished, frosted, and chased metallic surfaces are combined with the filigree-work, bear a considerable resemblance to Scandinavian jewellery; but the latter is more tinselly in effect, and coarser than the best specimens from Cuttack and Trichinopoly. The Chinese and Japanese understand filigree manufacture, but their works are not so tasteful, nor do they appear to be so much appreciated as those of India.

In commencing the manufacture of inlaid works in different metals, as brass, copper, bell-metal and silver, sheets of brass or of pure copper are usually selected, and cut into pieces that will form the required shape by hammering. The metal is frequently heated to a dull red to prevent it from splitting; and if the form is complex, the vessel is made in several pieces, the edges of which are beat out thin, and the overlapping edges, after being thoroughly cleaned from oxide by scraping or by nitric acid, are heated and welded together with a hard solder of brass, to which a little borax and resin in fine powder are added. The form of the vessel is then refined by hammering, the inside being supported by a rounded metal-anvil, held in the left hand. In some cases the planishing steel hammer and the rounded anvil fit upon each other accurately; at other times the object is finished and polished on the turning-lathe. The surface to be decorated is then slightly oxidized by being oiled, smoked, and heated; the pattern is drawn upon it with a sharp steel point, and finished with a graving-tool. Sometimes the pattern is very carefully drawn upon thin paper; this is pasted upon the polished metal, and the outline is made out with a succession of punched and dotted lines. When elaborate or complex patterns are required, punches are made of very fine steel to produce portions of these, as flowers, rosettes, or delicate curves. When patterns are to be produced by combinations of two metals, as brass upon copper, zinc upon brass, or silver upon copper, thin sheets of these metals are beaten out, and the patterns are stamped

with punches. For this purpose very pure metal is generally employed, and the surfaces are kept clean and bright, while the part of the vessel to which it is applied is roughened, and then moistened with a solution of borax, and the two metals are united by heating and hammering. The vessel is then cleaned with the acid pulp of tamarind, and finally polished with whitening, or chalk and water. Brass vessels are often cleaned with the pounded leaves of the tamarind or of the *Cicer arietinum*, Bengal gram, or chick-pea, beaten into a pulp. This yields an impure tartaric acid liquor, which produces various shades of colour, often of very pleasing tints, especially when applied to pure copper and gently heated. By adding a little cinnabar, or sulphuret of mercury, to this acid mixture, and then exposing the vessel to heat, after it has been coated with the mixture, an amalgam is formed which makes the silver and copper combine. The copper acquires a rich purple-brown colour, and the silver gets dark on the surface; but by rubbing with chalk, or fine emery powder, the silver resumes its brightness. Vessels of great elegance and purity of form are thus manufactured at Tanjore and Trichinopoly, where this branch of industry has met with encouragement, and has probably been carried on for many centuries. Fine collections of these manufactures may be seen at the India House Museum.

BRITISH HOROLOGICAL INSTITUTE.

AT the usual Monthly Meeting, held 13th ult., Mr. Jackson, V.P., in the chair, a letter was read from the Clerk of the Goldsmith's Company, stating that the Court of the Company had resolved to make a grant of 500*l.* in aid of the proposed new building for the institute. On the motion of the chairman a vote of thanks was passed to the Goldsmiths' Company for their munificent gift. Mr. Bridgman attended to receive the prize of 5*l.* 5*s.* which had been awarded to him by the judges for the best tool for measuring lever escapements. The chairman said he had had an opportunity of minutely examining the tool and of testing an escapement with it, and he felt bound to express his admiration of Mr. Bridgman's conception, and the manner in which he had carried it out.

Several new members were elected.

ROYAL MICROSCOPICAL SOCIETY.

A MEETING of this society was held on the 7th ult., Mr. H. J. Slack in the chair. A number of presents to the society were announced. A paper on a photograph of Nobert's bands, by the Count Castracane, was read to the meeting, by Mr. H. C. Sorby. Mr. Henry Davis gave an interesting account of some new observations which he had made upon *Conochilus volvox*. Mr. Charles Stewart described and exhibited under the microscope some minute species found only round the pentagonal opening on the under side of the shell of the *Echinoderms*. Two new Fellows were elected, and the proceedings were adjourned until October, notice being given that the office and library of the society would be closed during the month of August.

NEW PRINCIPLE OF ILLUMINATING PUBLIC CLOCKS.

JOSEPH CHALLENGER has patented a new and excellent arrangement for illuminating the disc or dial of church and turret clocks, at a greatly-reduced cost, and on an improved principle. The *Manchester Guardian* says that the invention has been applied to some of the public clocks in that city with very satisfactory results.

CURIOUS CALCULATION.—The curious in calculations, and readers who have a higher aim, will be interested in the following passage from a paper on "The Physical Constitution of the Sun," by Mr. Brayley. A railway train to the average speed of thirty miles an hour, continuously maintained, would arrive at the moon in eleven months, but would not reach the sun in less than 352 years, so that if such a train had been started in the year 1512, the third year of the reign of King Henry VIII., it would reach the sun in 1864. When arrived, it would be rather more than a year and a half in reaching the sun's centre, three years and a quarter in passing through the sun, supposing that it was tunneled through, and ten years and one-eighth in going round it. How great these dimensions are may be conceived from the statement that the same train would attain the centre of the earth in five days and a half, pass through it in eleven days, and go round it in thirty-seven days.

HONESTY IN THE WORKSHOP.

(From the "Jeweller's Circular.")

ONE of the greatest drawbacks in the jewellery business is, that so much care is necessary to avoid robbery. The burglar has to be guarded against, which involves expensive safes and night watchmen. Keen perception and a watchful eye are continually required to prevent loss by the shop-lifter and pretended buyer. In the workshop the manufacturer is in danger of being robbed by his workmen and apprentices, and no iron safe protects him from their dishonesty. He has to trust them with the ever-coveted gold, and often with precious gems. Much thought has been bestowed upon the subject, and plans for keeping exact account of the stock given out adopted by many, often embodying details of great minuteness; but all such plans are very troublesome and expensive, involving necessarily the employment of a careful person to keep account, and, after all precaution, often fall far short of the desired end. What, then, can the manufacturer do to protect himself? Cannot careful discrimination in the employment of help do much? Yes; do we not know the good workman is a poor thief? and is the steady, sober, industrious man as likely to be guilty as the idle, drunken, extravagant fellow who disgraces the shop he works in?

It may appear like accepting a low standard of morality, but really self-respect seems to guide many in the paths of honesty; and indeed there can be no doubt that an appreciation of the fact, that a man guilty of dishonesty is degraded in his own eyes, would keep most from the first act of dishonesty. A systematic arrangement, no matter how minute in detail, which will prevent robbery, or at once discover the thief in the workshop, seems impossible, but loss from dishonesty may be reduced to minimum by the discretion and keen observation of the executive, whether he be a proprietor in the business or a hired foreman. Where the management of a shop is left to a foreman, he should be a man whose superiority would command respect, who should be quick enough in his observation to know at all times everything which is going on around him, like the captain of one of the old "liners" between Liverpool and America, who instantly on coming on deck, without apparently looking aloft, would call to the mate or watchman, tell him of some trifling irregularity which ought to have received his attention. He should be a man who understands the business and can explain anything so as to be easily understood, and cheerfulness, patience, and diligence ought to be among his qualifications. And, with such a man at the head of a carefully-selected staff of fairly-remunerated help, there would be little risk of loss from robbery. Such a man must be well paid, of course, and he deserves it. He stands on his reputation; he has spent his life in studying his business and observing human nature; and, moreover, what he receives is a very small insurance on the amount entrusted to his care.

A word of encouragement or appreciation will often keep a boy, even a man, in the right path, and "Come, boys, let's make hay while the sun shines" will ensure the accomplishment of much more than "Hurry up, there" ever will. Discipline is more necessary in the one in charge of a shop than in any one else there. His exactness engenders precision in others, whereas if he be loose in his management and knowledge of his affairs and surroundings, looseness will pervade the whole shop, and looseness means diminution of profit through misused strength and energy, general unpunctuality, waste of time through wilfulness and stupidity, and encouraging opportunity for any one disposed to steal. In the consideration of this subject one idea suggests itself which might be of service to manufacturers and dealers; it is this, that the names of employes guilty of stealing should be communicated to some designated centre, and then communicated to the trade generally. Such a measure might, through fear, prevent some from falling into temptation, as an employer would consult his list before engaging a new man.

GERMAN EXHIBITION IN 1878.

AN exhibition of a somewhat unusual character will be opened in Berlin in 1878, the plans for it being already under discussion by an executive committee. Its object being to show Germans what Germans can do, and therefore in what points head can be made against foreign competition, the whole arrangements will be strictly national. The Exhibition will be classified in twenty-one groups, and prizes will be awarded in medals distinguished as for production, manufacture, commerce, art, science and education. Workmen's models will also be issued.—*Scientific American*.

A BLOCK of pure silver weighing 4500 lbs. has been sent from the Real Catorse Silver mines in Mexico to the Philadelphia Exhibition.

ACTION BY THE BOARD OF EXCISE FOR DEALING IN PLATE WITHOUT A LICENSE.

MELTON MOWBRAY PETTY SESSIONS,
TUESDAY, June 6th.

STEPHEN SMITH, jeweller, Melton Mowbray, was charged, on the information of Mr. Oates, Supervisor of Excise, with dealing in plate without having a proper license to do so.—Mr. Atter, Stamford, appeared for the prosecution, and Mr. Owston, Leicester, for the defence.—Mr. Atter, in opening the case, said that the information against the defendant was laid at the instance of the Excise. He should be able to show that on the 18th of February last an officer of the Inland Revenue called upon Mr. Stephen Smith, and asked to be shown an Albert chain. He asked for a good one, and selected one the price of which was 10*l.*, and its weight 2½ oz. The sum actually paid for the chain was 9*l.* 18*s.* The question arose, and the Bench had to settle the question, whether an offence had been committed or not. Mr. Atter then referred to several sections of the 30th & 31st Vict., c. 90, bearing on the matter of licenses and their conditions, which were required to be taken out by dealers in plate. He admitted that the weight of pure gold in the chain was only 1 oz. 11 dwts., but he held that the defendant had infringed the 5th section of the Act, which says “that any person who shall trade in or sell any article in gold or silver, composed wholly or in part of gold or silver,” &c. The chain purchased of the defendant was 18-carat gold; it weighed 2½ oz., and according to sec. 3 of the Act defendant was liable to a penalty of 50*l.*, he not having a license to deal in gold over 2 oz. weight.—Mr. Owston, in objecting to Mr. Atter's interpretation of the law, said that it was not at all likely that a respectable tradesman, like Mr. Smith, who had been in business thirty-five years, could be guilty of the charge of fraud, which the prosecution sought to establish.—Mr. Atter: I do not charge the defendant with fraud.—Mr. Pochin: You charge defendant with fraudulent dealing.—Mr. Atter: I do not; I charge him with not having a proper license.—Mr. Pochin: You are to prosecute, and if you are not here to prove a fraud, you are here for nothing. If a man uses a gun without taking out a license, he is guilty of a fraud on the Revenue. A man cannot be hung for his opinion, and that is mine.—The following evidence was then given:—T. H. T. Bartlett, examined by Mr. Atter: I am an officer of Inland Revenue stationed at Scalford. On the 18th of February last I went to Mr. Smith's shop, in the Market-place, Melton. Mr. Smith is a jeweller. I saw Mr. Smith. I asked him for a gold albert, and he took one out of the window. He took out several for me to look at. I selected one which he said was a good one—18-carat gold. He said, “These chains are usually sold by weight.” He weighed it. It weighed 2½ oz. I paid 9*l.* 18*s.* for the chain and received the receipt produced. The weight is stated on the receipt.—Cross-examined by Mr. Owston: I had been in the shop before. I had not sent a woman there. I had been twice. I asked for a gold albert—18-carat. Eighteen-carat gold is composed of eighteen parts of gold and six parts of alloy. I came to Melton under the orders of my superior officer. It is not usual to give notice if a proper license is not taken out. The albert was sold to me as a gold chain. I have never given the Melton jewellers any notice.—Re-examined by Mr. Atter: It is not usual to give notice in these cases as in the cases of carriages.—Mr. Owston, for the defence, said the case which the Bench had to decide was one of extreme difficulty. The section of the Act of Parliament under which the information was laid had never yet obtained a judicial decision. The Bench had been asked to look at the Act, and he referred them to the 5th section of the Act on which he relied. The Act speaks of “articles that are composed wholly or in part of gold,” and throws upon defendant to prove what part was alloy, and what part was gold. It was evident that this clause of the Act did not refer to the weight of the chain in the aggregate, but to the weight of pure gold it contained. Was the Revenue defrauded in this case? It was true if Mr. Smith had sold more than 2 oz. of gold he would be liable under the Act. The informer, when he went to Mr. Smith's shop, asked for a good gold chain, and he got what he asked for. He got a chain composed of twenty-four parts—composed of eighteen parts gold, and six alloy. What Mr. Smith actually sold to this informer was 1 oz. 11 dwts. of genuine gold. The defendant had a right to go into the component parts of which the chain was made. It was a case of fraud or no fraud, of honesty or dishonesty, and he took it that both in the spirit and the letter Mr. Smith was innocent.—Witness Bartlett was recalled, and, in answer to Mr. Frewen, said: When I

first went to the shop I saw only the chain produced and another. My object was to catch a tradesman trapping.—Oliver Green, examined by Mr. Owston: I am of the firm of Green & Co., 94, Hatton-garden, London, and am a dealer in gold. My firm is well-known. Eighteen-carat gold is six parts less than twenty-four, which is the old standard. The chain produced is 18-carat. Such chains are always composed with alloy.—Cross-examined by Mr. Atter: We could make chains of pure gold, but they would be very soft. If a person came to me for a good gold chain he would get one like the one produced.—By the Bench: We sometimes make 20 and 22-carat gold. 20-carat would not stand ordinary wear. We have the larger license. We do not know what license our customers have.—This being the whole of the evidence the magistrates retired, and on their return Mr. Frewen stated that the Bench were unanimously of opinion that the summons should be dismissed—a decision which was received with applause by a crowded court.

William Bowley, jeweller, Melton, appeared to answer a similar charge to the above, and the same professional gentlemen appeared in the case.—Mr. Atter, in opening the case, said that Mr. Bartlett, the witness in the last case, went to the shop of Mr. Bowley, on the 28th of February, and asked for some gold alberts. Certain chains were shown to Bartlett, but they were not good enough. Mr. Bowley then said he could get one, and he was to call again in two or three days. Accordingly Mr. Bartlett called again, and defendant took some chains out of the window, one of which was selected and bought for 15*l.* Mr. Bowley gave a receipt (produced) signed “pro Messrs. Green & Co., W. B.” Informant then said, “I buy of you and not of Messrs. Green,” when defendant said, “If I give you my own receipt, I may have the Excise down upon me.” A receipt was then given on one of defendant's own bill-heads, and signed “pro G. & Co., W. B.”—T. H. T. Bartlett, examined by Mr. Atter, said: On the 18th of February I called at Mr. Bowley's shop, Melton Mowbray. I asked for some gold alberts, and some were shown me. I said I thought they were not good enough. Bowley said if I would call again in a few days he could get me some to choose from. On the 29th of February I called again. Mr. Bowley took from his window six chains, and showed them to me. I selected one of three chains. Mr. Bowley said it was London weight—pure gold—18 carat. I took up another of the six chains. I took it in my hand and asked him the weight. He weighed two chains. One weighed 2½ oz., the other 1 oz. 16 dwts. I bought the heaviest, and paid 15*l.* for it. I received a receipt “pro Messrs. Green & Co.,” and signed by Bowley's initials. I declined to take that receipt. I said, “I do not know those parties, I am dealing with you, as I might be called upon to pay this over again.” Bowley said, “If I do not put Messrs. Green & Co. the Excise might be down upon me.” I asked him what he meant, and he said he only held a license to sell gold under 2 oz. weight, and if he was to sell it over he would be liable to a penalty of 50*l.* He then said, “I'll give you one of my own bill-heads.” The chain I produce. The bill was receipted “pro H. C. G. & Co., W. Bowley.” This (the chain) was purchased in a shop at Melton Mowbray kept by the accused.—Cross-examined by Mr. Owston: I had been in the shop several times before. I went simply to make a detection. The gross weight is 2 oz. 16 dwts. without alloy. The first time I went (the 18th February) for a good gold chain. Bowley asked me to come again. He did not mention a wholesale house. I went on purpose to trap him. On the second time I produced my own chain. I did this by my diplomacy. The one that defendant had was the heaviest. The chain I showed him belonged to Mr. Oates, the supervisor. Defendant prepared a form of receipt, which I refused, because it was for Green & Co. I thought I should not get a conviction if I took it. I wanted to catch Mr. Bowley for selling without a proper license. I knew that he had got the chain purposely for me. My object was to get the penalty of 50*l.*—Re-examined by Mr. Atter: When I went the second time the six chains were exposed in the window.—Mr. Owston, in addressing the Bench on the part of Mr. Bowley, spoke in unmeasured terms of the conduct of the witness Bartlett, who had, in the most unblushing manner, admitted that he had carried on this business with the intention of “trapping” and tempting an honest tradesman. The conduct of this man was unworthy of a person engaged in her Majesty's service and wearing her livery. Mr. Owston was continuing his remarks, when he was stopped by Mr. Frewen, who stated that the magistrates were unanimously of opinion that Mr. Bowley never intended to commit a fraud, but it was perfectly right that the Excise should, at all times, do their duty. The Bench had decided to dismiss the case as against Mr. Bowley.—In both cases Mr. Oates gave notice of appeal to Quarter Sessions.—*Grantham Journal.*

HISTORY OF ASTRONOMY.

THE science of astronomy, being so beneficial in its effects to the mind of man, deserves our utmost attention, and claims our highest admiration.

By this sublime science we are enabled to explore the whole universe, so far as the human eye can reach, pursue the different planets in their uniform course, and the devious comet through the fields of ether, and also trace the laws by which the spheres perform their evolutions with so much order and harmony. These contemplations are worthy every rational being, and have for many ages engaged the minds of the most intelligent and enlightened men of every nation. Indeed, it is impossible to suppose a period, even in the infancy of the world, when the splendid objects which the heavens present did not attract the attention of mankind, and incite them to observe their motions and their influence on sublunary affairs. Though the heavenly bodies cannot affect the events of our lives, nor indicate to us either good or bad fortune, they regulate the seasons, the divisions of time, the latitudes and longitudes of the different portions of the globe, and a variety of things highly interesting to mankind at large, and to scientific persons in particular. Without noticing the traditions and fabulous accounts of the state of astronomy among the antediluvians, we would merely observe that the Assyrians, Chaldeans, and Egyptians are the earliest people who cultivated astronomy of whom we have any authentic account. Their opinions were, however, exceedingly erroneous, and mixed with some of the wildest absurdities that could enter the imaginations of men. Yet they began early to make valuable observations on the periodical motions of the heavenly bodies and on the phenomena of occultations, eclipses, &c., of the causes of which some of the more judicious formed tolerably correct notions. Several observations on lunar eclipses were made as early as B.C. 720, which were afterwards recorded by Hipparchus, and have been transmitted to us by Ptolemy.

Herodotus and Diodorus Siculus speak of the Temple of Jupiter Belus at Babylon, and the lofty tower that surmounted it, as an observatory, from whence the Chaldeans observed the stars; the account by the latter of the golden statues that adorned it is rather problematical, and little to the purpose.

From the Chaldeans and Egyptians the science passed to the Phœnicians, who, being a maritime and commercial people, studied it for the purpose of navigation; from their having sailed to high latitudes in the northern hemisphere, they had opportunities of observing stars invisible to the Chaldeans and Egyptians, and to them we are indebted for the discovery of the Polar star, so useful to direct the course of mariners before the invention of the compass.

The Greeks, ever anxious to obtain information in everything that related to the arts and sciences, travelled into different countries for the purpose of acquiring the rudiments of knowledge which they afterwards improved with that diligence and skill for which they were remarkable. So early as the Argonautic expeditions, B.C. 1263, it is supposed that they were acquainted with the method of arranging the stars in constellations, but whether they were the inventors of this method, or merely adopted the inventions of others, is not recorded.

Thales, the founder of the Ionian sect, who flourished about 600 B.C., was the first among the Greeks who cultivated this science on anything like true principles. He explained the theory of eclipses, and gave an example of the method of cultivating and predicting them; he taught the cause of the inequality of the days and nights. His pupil, Anaximander, who taught between 500 and 600 years B.C., is supposed to have had a right idea of the globular form of the earth, to have invented maps and dials, to have discovered the obliquity of the ecliptic, with the equinoxes and solstices, and, in conjunction with his master, Thales, to have greatly improved the arrangement of the stars into constellations. The planets Saturn, Jupiter, Mars, Venus, and Mercury, were known to the Chaldeans, but their motions and phenomena were not accurately observed above 200 years before the Christian era. The zodiac of the Greeks, previous to the time of Thales, is thought to have comprised only the apparent paths of the sun and moon; but at that period it assumed a more perfect form, and was divided into the twelve constellations, or signs of the zodiac, which are retained to this day; the inclination of the orbits of the planets to the ecliptic was ascertained, but the nature of comets was ill understood, they being considered as mere transient meteors portending some calamity, or at least an important event.

The name of Pythagoras, who flourished about 590 B.C., is illustrious, not only as the founder of a sect of philosophers, but as a sagacious observer of the heavenly bodies. Besides confirming

the opinion of Anaximander that the earth is a globe, he discovered the true system of the universe, which ignorance and bigotry so strongly opposed that, with the exception of a few of his immediate disciples, it was rejected as absurd and impossible, though many years after its truth was verified beyond contradiction.

It would be occupying space and the reader's time unprofitably to narrate the absurd fancies and reveries of Anaximenes, Anaxagoras, and the Greek astronomers, who published conjectures concerning the heavenly bodies, which appear to us now not only erroneous, but ridiculous.

Yet, though popular prejudice rendered it dangerous to teach the solar system as discovered by Pythagoras, and that philosopher accordingly temporized, teaching publicly the generally-received notions, and imparting the truth privately only to his confidential disciples, one of them, Philolans, boldly declared his conviction that the earth revolved round the sun; prejudice was as yet, however, too strong for reason, and it was not received.

As one chief end of the study of astronomy was to measure time with accuracy, great efforts were made to determine with precision the apparent motions of the sun and the real ones of the moon, and to adjust them to each other. After numerous accurate observations, and many futile attempts, Meton, of Athens, B.C. 430, invented the period of nineteen years, now called the Metonic or golden cycle, though many learned men deny him this honour and attribute this invention to the Chaldeans, many ages previous.

Though the Metonic cycle was at first considered perfectly accurate, time discovered it to be defective; improvements were made in it by various succeeding astronomers, but no cycle has yet been discovered of sufficient accuracy to serve for nice computations.

In the time of Alexander the Great flourished the celebrated Aristotle and Callisthenes, both eminent astronomers, the latter of whom, by command of the king, made a distinct and accurate description of the countries under the dominion of that monarch by direct measurement and observations of the correspondence of terrestrial objects with the position of the stars, thereby rendering geography, by means of its alliance with astronomy, a real science.

Nor was the cultivation of astronomy confined to the Greeks. We learn from Cæsar that the Druids diligently instructed their youth in what concerned the motion of the stars and the extent of the earth and heavens. Pytheas, an astronomer of Marseilles, urged by the wish of making discoveries in the science, sailed northwards, B.C. 380, until he reached an island, supposed to be Iceland, where he affirmed that in summer the sun rose again almost immediately after it had set. This, which is now known to be fact, was ridiculed as fabulous by the philosophers of those days, and Pytheas, who appears to have possessed great learning and talents, was treated as a visionary. He discovered that the phenomena of the tides are connected with the motions of the moon, and that the Polar star is not precisely at the Pole.

(To be continued.)

RISE IN THE WORLD.—Experience continually contradicts the notion that a poor young man cannot rise. If we look over the list of rich men, we find that nearly all of them began life worth little or nothing. To any person familiar with the millionaires of the United States, a score of examples will occur. On the other hand, the sons of rich men, who began life with the capital which so many poor young men covet, frequently die beggars. It would probably not be going too far to say that a large majority of such moneyed individuals either fail outright or gradually eat up the capital with which they commenced their career. And the reason is plain. Brought up in expensive habits, they spend entirely too much. Educated with high notions of personal importance, they will not as they phrase it stoop to hard work. Is it astonishing, therefore, that they are passed in the race of life by others with less capital originally but more energy, thrift, and industry? For these virtues, after all, are worth more than money. They make money in fact. Nay, after it is made, they enable the possessor to keep it, which most rich men pronounce to be more difficult than the making. The young man who begins life with a resolution always to lay by part of his income is sure, even without extraordinary ability, gradually to acquire a sufficiency, especially as habits of economy, which the resolution renders necessary, will make that a competence for him which would be quite insufficient for an extravagant person. It is really what we save, more than what we make, which leads us to fortune. He who enlarges his expenses as fast as his earnings increase must always be poor, no matter what his abilities. And content may be had on comparatively little. It is not in luxurious living that men find real happiness.—*Scientific American*.

FINGER RINGS

(Continued from page 7).

MODERN RINGS.

THE period known as mediæval commences with the fall of ancient Rome under the Gothic invasion, and concludes with the capture of Constantinople by the Turks in 1453. The modern era, therefore, commences in the middle of the fifteenth century, during the time of Henry VI.

As private wealth increased finger rings became much more ornamental; to the art which the goldsmith and jeweller devoted to them was added that of the engraver and enameller. Fig. 79, from the Londesborough collection, is decorated with floral ornaments, engraved and filled with green and red enamel colours. The effect on the gold is extremely pleasing, having a certain quaint sumptuousness peculiarly its own. Fig. 80 is a fine specimen, from the same collection, of a signet ring, bearing a "merchant's mark" upon its face. These marks varied with every owner, and was as peculiar to himself as the modern autograph; they were a combination of initials or letter-like devices, frequently surmounted by a cross, or a conventional sign, believed to represent the sails of a ship, in allusion to their trading vessels. The marks were placed upon the bales of merchandise and were constantly used where the coat armour or badge of persons entitled to bear arms would be placed. The authority vested in such merchant's rings is curiously illustrated in one of the historical plays on the life and reign of Queen Elizabeth, written by Thomas Heywood, and to which he gave the quaint title, "If you Know not Me, you Know Nobody." Sir Thomas Gresham, the great London merchant, is one of the principal characters, and, in a scene where he is absent from home and in sudden need of cash, he exclaims, "Here, John, take this seal ring; bid Timothy presently send me a hundred pound." John takes the ring to the trusty Timothy, saying, "Here's his seal ring; I hope a sufficient warrant."



FIG. 79.



FIG. 80.

To which Timothy replies, "Upon so good security, John, I'll fit me to deliver it." Another merchant, in the same play, is made to obtain his wants by similar means—

"———Receive thou my seal ring:
Bear it to my Factor; bid him by that token
Sort thee out forty pounds' worth of such wares
As thou shalt think most beneficial."

The custom must have been common to be thus used in dramatic scenes of real life, which the plainest audience would criticize. These plays were produced in 1606, and serve to show that the value attached to a seal ring descended from very ancient to comparatively modern times.

In the Waterton collection is a massive gold signet ring, with the rebus of the Wylmot family quaintly designed in the taste of the fourteenth century. In the centre is a tree; on one side of it are the letters W Y, and on the other O T. Supposing the tree to be an elm, the name reads Wy-elm-ot, or Wylmot.

In the fifteenth and sixteenth centuries religious figures were frequently engraved on rings.

Fig. 81 represents a ring upon which is very delicately engraved a representation of St. Christopher bearing the Saviour on his shoulder across an arm of the sea, in accordance with the old legendary history of this saint. The circle is formed by ten lozenges, each of which bears a letter of the inscription DE BOEN EUER.



FIG. 81.



FIG. 82.

The figure of St. Christopher was used as an amulet against sudden death, particularly by drowning; for it was popularly believed that no sudden or violent death could occur to any person on any day when he had reverently looked upon this saint's effigy. Hence it was not uncommon for charitable individuals to place such figures outside their houses, or paint them on the walls. There is a colossal figure (and St. Christopher was said to have been of gigantic stature) thus painted beside the great gate of the ancient city of Treves, on the Moselle.

The enameller and engraver are both employed on the ring, Fig. 82, also from the Londesborough collection. The hoop is richly decorated with quaint, floriated ornament cut upon its surface, and filled in with niello, then extensively used by goldsmiths for enriching their works, as it is still in Russia. This beautiful ring is inscribed inside with the motto MON COR PLESCER—"My heart's delight"—and was doubtless a *gage d'amour*.

Of Elizabeth of England and Mary of Scotland interesting

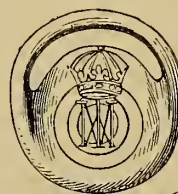


FIG. 83.



FIG. 84.

mementoes are preserved in the shape of rings. Fig. 83 represents the gold signet ring of Mary, now preserved in the British Museum. Upon the face is engraved the royal arms and supporters of Scotland, with the motto IN DEFENS, and her initials, M. R. But the most curious portion of the ring is the inner side of the seal, as shown in the cut, where a crowned monogram is engraved, which might have been an unsolved enigma but for the existence in our State Paper Office of a letter written by Mary to Queen Elizabeth, in which she has drawn this identical monogram, after signing her name. Sir Henry Ellis, who first traced this curious history, says, "It is clearly formed of the letters M. and A. (for Mary and Albany), and gives countenance to the opinion that the written monogram was intended for Elizabeth and Burleigh to study; the subsequent creation of the title of Duke of Albany, in Lord Darnley, ultimately opening their eyes to the enigma." Elizabeth's intense dislike to the Darnley marriage is well known, as she endeavoured to force Mary into a match with one of her own favourites, the Earl of Leicester.

The Waterton collection boasts of a gem of no inferior interest in connection with this unhappy marriage. It is the ring of Henry, Lord Darnley, husband to Mary, Queen of Scots. On the bezel it bears the initials M. H., united by a lover's knot, and within the hoop the name engraved of HENRI. L. DARNLEY, and the year of the marriage, 1565. The cut (Fig. 84) shows the face of the ring with the initials; below is engraved a fac-simile of the interior of the ring as a plane surface.

Queen Elizabeth's history, and that of her unfortunate favourite the Earl of Essex, has a tragic story connected with a ring. The narrative is popularly known, and may be briefly told. It is said that the queen, at a time when she was most passionately attached to the earl, gave him a ring, with the assurance that she would pardon any fault with which he might be accused when he should return the pledge. Long after this, when he was condemned for treason, she expected to receive this token, and was prepared to have granted the promised pardon. It came not. The queen was confirmed in the belief that he had ceased to care for her, and pride and jealousy consigned him to the death of a traitor. But the earl had, in the last extremity of despair, entrusted the ring to the Countess of Nottingham, wife of the Lord High Admiral, an enemy to the unfortunate Essex, who forbade his wife to take any proceedings in the matter, but to conceal the trust entirely, and secrete the ring. When the countess lay upon her death-bed she sent for her royal mistress, for the first time told her guilt, "and humbly implored mercy from God and forgiveness from her earthly sovereign, who did not only refuse to give it, but, having shook her as she lay in bed, sent her, accompanied with most fearful curses, to a higher tribunal." Such is the awful account of the scene by Francis Osborne. Dr. Birch says the words used by Elizabeth were, "God may forgive you, but I never can." It was the death-blow to the proud old queen, whose regret for the death of Essex could not be quenched by her pride and belief in his ingratitude; a confirmed melancholy settled upon her; she died lonely and broken-hearted.

This ring is now in the possession of the Rev. Lord John Thynne, and three views of it are given in Figs. 85, 86, and 87. It is of gold, of extremely delicate workmanship throughout. A cameo head of the queen is cut on hard onyx, and set as its central jewel; the execution of this head is of the highest order, and may possibly have been the work of Valerio Vincentino, an Italian artist who

visited England and cut similar works for Elizabeth and Burleigh. It is one of the most minute but the most striking likenesses. The hoop of the ring is enriched with engraving, and the under surface decorated with floriated ornament, relieved by blue enamel. It



FIG. 85.



FIG. 86.



FIG. 87.

has descended from Lady Frances Devereux, Essex's daughter, in unbroken succession from mother and daughter to the present possessor. Although the entire story has met with disbelievers, the most sceptical must allow that, whether this be the ring or not, it is valuable as a work of art of the Elizabethan era.

A ring possessing even greater claim to notice, but depending for its appropriation on its own internal evidence, is the next on

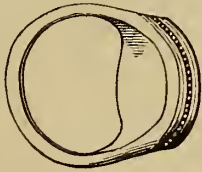


FIG. 88.



FIG. 89.

our list (Figs. 88 and 89). It purports to be the seal ring of William Shakspeare, and was found March 16, 1810, by a labourer's wife, in a mill elose adjoining Stratford-on-Avon churchyard. It passed into the possession of R. B. Wheler, Esq., the historian of the town; and his sister, at his death, presented it to the museum of Shaksperian relics formed in the birthplace of the poet. It is of gold, weighing 12 dwts.; having the initials W.S. braced together by a tasselled cord; the only other ornament upon the ring being a band of pellets and lines on the outer edge of the bezel.

Is it Shakspeare's? It is evidently a gentleman's ring, and of the poet's era. It is just such a ring as a man in his station would fittingly wear—gentlemanly, but not pretentious. There was but one other person in the small town of Stratford at that time to whom the same initials belonged. This was one William Smith, but his seal is attached to several documents preserved among the records of the corporation, and is totally different. Mr. Halliwell, in his "Life of Shakspeare," observes that "little doubt can be entertained that this ring belonged to the poet, and it is probably the one he lost before his death, and was not to be found when his will was executed, the word *hand* being substituted for *seal* in the original copy of that document."

In the great poet's will five of his friends have bequests of memorial rings. Two are his townsmen, Hamlett Sadler and William Raynolds, who each have twenty-six shillings and eightpence left them "to buy them ringes;" the other three being the actors ("my fellows," as he affectionately terms them) John Heminge, Richard Burbage, and Henry Condell, each of whom has a similar sum.

Rings were at this time an almost necessary part of the toilet of a gentleman; they indicated rank and character by their style or their devices. Hence the wills and inventories of the era abound with notices of rings, many persons wearing them in profusion, as may be seen in the portraits painted at this time. The Germans particularly delighted in them, and wore them upon many fingers, and upon different joints of the fingers, the forefinger especially—a custom still followed by their descendants. The ladies even wreathed them in the bands of their head-dresses. Rabelais speaks of the rings Gargantua wore because his father desired him to "renew that ancient mark of nobility." On the forefinger of his left hand he had a gold ring, set with a large carbuncle; and on the middle finger one of mixed metal, then usually made by alchemists. On the middle finger of the right hand he had "a ring made spire-wise, wherein was set a perfect bawley ruby, a pointed diamond, and a Physon emerald of inestimable value."

Italy now furnished the most splendid and tasteful jewellery; the workmen of Venice exceeding all others. The Londerborough collection supplies us with a graceful example, Fig. 90. The claws support the setting of a sharply-pointed pyramidal diamond, such as was then coveted for writing on glass. It was with a similar

ring Raleigh wrote the words on the window-pane—"Fain would I rise, but that I fear to fall"—to which Queen Elizabeth added,



FIG. 90.

"If thy heart fail thee, do not rise at all;" an implied encouragement which led him on to fortune.

In Burgon's life of Sir Thomas Gresham is engraved the wedding ring of that merchant-prince. "It opens horizontally, thus forming two rings, which are, nevertheless, linked together, and respectively inscribed on the inner side with a Scripture poesy. *Quod Deus conjunxit* is engraved on one half, and *Homō non seperet* on the other."

(To be continued.)

GREENWICH TIME SIGNALS AND CHRONOMETER RATING.

THE Astronomer Royal, in his Report to the Board of Visitors, June 3rd, 1876, says:—

"There are now in the chronometer room 161 chronometers, of which 128 are box-chronometers, 25 pocket-chronometers, and 8 deck-watches.

"Of these 47 are the property of chronometer makers, being placed here on the annual competitive trial; the others belong to the Government, and have been either returned from service for examination and repair, if necessary, or are awaiting issue to ships of the Royal Navy after having been repaired by the maker. All such chronometers are compared at least once a week, and at some time during their period of rating are tried for at least three weeks in a temperature of nearly 100° Fahrenheit. The competitive chronometers, as well as any Government chronometers which appear to require it, are compared every day; they undergo two trials in heat for periods of four weeks each, and are also rated in different magnetic positions.

"The supplementary compensation mentioned in the last Report has been applied with success to a number of chronometers, and in future all chronometers sent in to the annual trial are to be so fitted.

"From experiments which have been made with one of the chronometers, to which the compensation piece has been applied, it is found that the final adjustment of the compensation can be made with certainty at the Observatory; and it will thus be unnecessary to return a chronometer to the maker, when, as has happened in a large proportion of cases lately, there is a slight error in the compensation.

"The first six chronometers in the competitive trial of last year were on the average somewhat superior to those of 1874; the chronometer at the head of the list, in particular, being a very fine one.

"The Greenwich time-ball has been regularly dropped automatically on every day throughout the year, with the exception of seven days, when the violence of the wind made it imprudent to raise the ball, and of two days when there was accidental failure.

"The Deal time-ball was not raised (on account of high wind) on ten days, and was not dropped, or was erroneously dropped (by telegraph signals), on seventeen days."

In gilding cast brass articles, which are required to be left dead in the hollow and chased surfaces, the best plan is first to wash the article in a solution of caustic soda (a solution of soapmaker's "soda ash" will do) or potash, then, after well rinsing, dip the article for an instant in fuming nitric acid, and after it has become thoroughly acted upon all over plunge it instantly in cold water: the article should then be well rinsed in hot water, and is then ready for the gilding bath. Articles of this description seldom require to be strongly gilt, the colour being the principal object. The bright surfaces may require to be burnished.—*Scientific American*.

FORGED ANTIQUES.

THE ancient art of engraving upon stones, whether in the way of intaglio or cameo, has often been imitated—the stones which have been generally chosen by the engravers being of the agate or quartz section of the rock: the carnelian, sardonyx, amethyst, or even the very hardest precious stones known to us, the ruby and the sapphire. These have been engraved in various ways, but most usually by means of diamond point and powder—"diamond cut diamond"—with rapidly revolving wheels or discs of steel. In this way heads and groups of figures have either been cut into the stone (intaglio) or else left prominent in high or low relief in one or more shades of the stone that has been chosen for the purpose, while the background remains of another shade of colour (cameo). On account of the hardness of the stones chosen, these little sculptures are, in fact, indestructible. Many of them are contemporary with the works of Phidias and other great sculptors of the finest age of Greek art; and while the larger marbles have perished, these gems have lain hidden in the bosom of the earth for well-nigh two thousand years, during all that dark and dreary time when the decaying Roman Empire was tottering to its grave—to be turned up at last by the ploughshare and the spade of a modern civilization, and adorn the cabinet of a nineteenth-century gem collector. The writer of this article has in his possession, for instance, a stone (carnelian) of the exact size of the little-finger nail, with a group of three figures cut upon it, and so beautifully and skilfully carved that the finest microscope can discover no flaw or imperfection in the anatomy of the figures, which are as perfect, in their way, as the dying gladiator or the Apollo of the Vatican. This gem is of the time of Augustus, and consequently nearly two thousand years old. The little drawer of a cabinet on the study table can, therefore, hold a collection of antique or modern gems (and many of the carvings of the eighteenth century are very good), so that a collector of moderate means and appliances may have within his reach sculptures as beautiful and perfect—although in miniature—as those which adorn the galleries of Chatsworth, or even the walls of the Vatican. It seems a strange thing that a study so fascinating as the study of antique gems should have almost died out from among us, or rather should have altogether died out, within the last hundred years, and should only now begin to have a renaissance. And we have some difficulty in accounting for the fact. In the last century it was even fashionable to collect these waifs and strays of antiquity. A dactyliotheque, or cabinet of gems, was an essential part of the dignity of a European prince, particularly if he aspired to be considered a sovereign of good taste; so that even the bucolical mind of good King George III. was moved within him to purchase, at a large price, the cabinet of Consul Smith, which he added to the small royal collection mainly transmitted by Charles I. Emperors, empresses, conquerors, and philosophers were alike carried away by the mania for forming collections of gems. And, of course, all wealthy people with any pretensions to fashion and taste followed suit. But the fact is that the *Cognoscenti* (as they loved to be called) of the last century made a sad mess when they attempted gem collecting. They soon found themselves in the position of the whale between the thrasher and the swordfish. They seemed to have been imposed upon on every side and in every possible way. The dactyliotheque fever ran so high that it became quite necessary for the patient to be excessively bled. And a class of forgers sprung up were quite capable of performing that medicinal office. The methods were various. Antique engravings were copied by the dozen, so that for every ancient gem of importance and beauty there may probably be a score or two of modern replicas about in the world. These modern antiques were often crammed down the throats of turkeys with their food, that by the grinding of the gizzard they might obtain that roughness of the polished surface—the wrinkles of age—which is one of the marks of antiquity. Rude antique engravings were touched up and repolished. And almost every genuine antique passed through the process of having the signature of some renowned artist of old forged upon it, by which its value was immediately doubled in the gem market of that day. Prices were quite tempting enough to induce clever rogues to do all they knew in order to deceive. A thousand pounds was no uncommon price to be given for a finely-engraved gem which had some savour of antiquity about it. Then almost in a moment, like a sudden fall in the stock exchange, the reaction came. "The thermometer fell below zero in a single night." The world of amateurs began to find out how heavily they had been duped, and refused to burn their fingers any longer with the handling of antique gems. In fact, the whole art became discredited. The forger-artists of the eighteenth century, and they were a race of clever and excellent workmen, died out and left no successors behind them. Indeed, so completely had all

public interest in this branch of the fine arts perished, that a dozen of years ago finely-engraved gems, which would have brought hundreds but fifty years before, could be purchased without difficulty for as many pounds. For a second time in the world's history the art of gem-engraving disappeared from the centres of culture and civilization.—*Fraser's Magazine*.

THE SATELLITES OF URANUS AND EXTRA-ORDINARY EYESIGHT.

AT a recent meeting of the Royal Astronomical Society a paper was read in which it was stated that a gentleman in Ireland had lately made several observations of the satellites of Uranus, using a refractor of only 4·3 in. aperture.

If no mistake has been made here (and it really seems that there has not) the observer, Mr. Ward, must be gifted with the most extraordinary eyesight that has ever been heard of, not even excepting that of Mr. Dawes.

A STORY OF A DIAMOND.

THE diamond has always enjoyed an undisputed pre-eminence among precious stones, not only on account of its rarity, but also from its unequalled brilliancy. Some of these stones have been sold for almost fabulous prices, and many of the most celebrated diamonds known to exist have changed hands from time to time under strange and romantic circumstances.

Among the jewels formerly in the regalia of England was a diamond of great beauty and value, with which is connected a very remarkable history. It was once the property of Charles the Bold, last Duke of Burgundy, who wore it in his hat at the battle of Nancy, in which he lost his life.

The diamond was found on the field after the battle by a Swiss, who sold it to a priest for a trifle, and it afterwards became the property of a French nobleman named De Sancy. The treasure remained in the possession of his family for more than a century, when one of his descendants, who was captain of the Swiss guard under Henry III. of France, was commissioned by the king to raise a new force from the same nation. Henry at length found himself unable to pay his soldiers, and in this emergency he borrowed the diamond from the Count de Sancy, that he might place it in the hands of the Swiss government as a pledge for the fulfilment of his engagements.

The count entrusted the diamond to one of his most faithful followers for conveyance to the king; but the messenger and the treasure disappeared, to the great consternation both of Henry and De Sancy. The most diligent search was made, but without furnishing any clue to the mystery. So strong was De Sancy's confidence in the perfect probity of his servant, that he felt convinced some misfortune must have happened to him; and he persevered in his inquiries, until he at length discovered that his follower had been waylaid and murdered by a band of robbers, and the body concealed in a neighbouring forest.

De Sancy ascertained the locality, and instituted a careful search, which resulted in the discovery of his messenger's remains. He next gave directions to have the body opened; when, to the astonishment of all but De Sancy himself, the treasure was discovered. It was now clear that the poor fellow, on finding himself beset beyond the possibility of escape, had swallowed the diamond rather than that it should fall into the hands of the robbers. The story has been commemorated in the appellation the diamond has ever since borne of "the Sancy."

The diamond was purchased for the Crown of England; but James II. carried it with him in his flight to France in 1688. Louis XV. is said to have worn it at his coronation. In 1835 it was purchased by a Russian nobleman for 80,000*l*.

IN BRITANNY there is said to prevail a very singular matrimonial custom. On certain fête-days the young ladies appear in red petticoats, with white or yellow borders around them. The number denotes the portion the father is willing to give his daughter. Each white band, representing silver, betokens one hundred francs of rent, and each yellow band denotes gold and stands for a thousand francs a-year. Thus, a young farmer who sees a face that pleases him has only to glance at the trimmings of the petticoats to learn in an instant what amount accompanies the wearer.

THE dial of the large clock at the Houses of Parliament is in future to remain illuminated till daylight, instead of the light being extinguished on the rising of the House, as formerly.

SHOOTING-STARS AND AEROLITES.

NEARLY every one must have had some opportunity of noticing, especially in the fine and calm nights of July and August, luminous bodies shooting along the firmament and darting towards the earth, or suddenly disappearing in the atmosphere. Similar appearances are noticeable in the very clear frosty nights of winter; but those which appear in the summer-time are larger, and more starlike in their brilliancy. Even at this day there are many who deem them to be really *loosed* and *wandering stars*; and, as imagination is always very powerful in ignorant minds, the supposed stars are connected with divers portents and prophetic indications.

One might suppose that the rapidity with which they disappear, and the fact that they produce no kind of effect upon our globe, would suffice to dispel the notion of their being stars; but where the mind is not well stored with facts, fancy reigns supreme, and commands belief in the most inconsistent and absurd suppositions.

These short-lived though brilliant wanderers of the air are to be explained satisfactorily in a very few words. Our earth is constantly exhaling volatile particles into the atmosphere, gases are formed, mixed, ignited by their own force and tendency, and almost instantaneously deprived of their peculiar nature and blended with the overpowering and receiving atmosphere.

Occasionally, the meteoric particles being more abundantly collected, and the state of the atmosphere being favourable to their gaseous existence, meteors of vast size and great splendour have made their appearance, and traversed the firmament so long as to be successively visible in places a thousand miles distant. This was the case with one which appeared in the year 1783, which was seen not only in many parts of Scotland and England, but also at Calais, Ostend, Brussels, Paris, and Nantes in Burgundy. Its appearance is described as being that of a luminous and nearly globular body, which, as it progressed, apparently divided into numerous balls of various magnitudes, but all leaving a luminous train behind them. Its disappearance, according to the testimony of very numerous witnesses was accompanied or quickly followed by a report similar to that of a cannon discharged at a distance from the auditors—a circumstance the more remarkable as, according to several observations, the elevation of the meteor could not have been less than fifty miles above the surface of the earth.

But these were gaseous meteors, which became extinguished and absorbed by the atmosphere, and must not be confounded with those solid and ponderous bodies which traverse the atmosphere like huge and burning globes, and explode with a loud report, which is sometimes followed by a shower of stones of considerable size and weight. Early in the present century one of these globes, to which the name of *aërolites* is given by some, and that of *bolites* by others, appeared in the atmosphere near *Caen*, in Normandy. It moved very rapidly and at a great height, and had the appearance of a globe of fire. On arriving just above the town of *Aigle*, it remained stationary for a brief space, and then exploded with several loud and sharp reports, throwing stones down upon various spots for a distance of two leagues and a half around the point to which its position had seemed vertical. The reports of this extraordinary occurrence reached the French government, and a scientific man was sent to inquire into the circumstances. The report confirmed all that the inhabitants of the neighbourhood had alleged, and he ascertained, beyond a doubt, that the stones, of the kind called thunder-stones, though in some instances only two or three drachms in weight, were in others as much as from eighteen to twenty pounds.

In many other parts of the world, and in climates of the greatest dissimilarity, as Switzerland, Benares, in the East Indies, Oxfordshire, and Greece, similar meteors have appeared and been followed by the descent of showers of *aërolites*, or by single ones of vast size. Those of them which have been broken have, in their interior, presented the appearance of pyrites.

Much difference of opinion has naturally existed as to the manner in which these singular bodies are produced. Some have supposed them to be fragments of planets detached with such force as to become subject to the earth's motion, and then precipitated to the earth by their own weight. On the other hand, some philosophical chemists imagine that they are chemically formed in the atmosphere; fluids disengaging, and the bases approximating and forming larger or smaller bodies, which ignite by the rapidity of their motion, and thus explode into fragments, which necessarily fall to the earth.

SILVER PLATERS' STRIPPING LIQUID.—Sulphuric acid, 8 parts; nitric, 1 part. Used to recover silver from old-plated wire.

DEMAGNETIZATION OF WATCHES.

WATCHES worn by students and others in technical laboratories are often rendered useless by being magnetized by the magnets used in such places. Magnets kept in the house often create equal mischief by being laid near watches, and much time and expense are sometimes needed to demagnetize them before they can be made to work. A serious case of this kind of injury recently led Professor A. M. Mayer, of the Stevens Institute of Technology, Hoboken, to experiments which resulted in a very simple method of demagnetization. The magnetized watch was laid upon a table in the neighbourhood of a common compass needle. Each hour on the face was then placed in turn before it to discover the location and intensity of the magnetism in the watch. The movements of the compass showed the north and south poles to be located (say) at the figures v. and xi. while the neutral points were at viii. and ii. The watch was then held in a horizontal position before a large bar magnet, the south poles of each being together. A gentle tilting motion was given to it for a moment, and on trying the watch again before the compass a sensible decrease of magnetism was observed. The process was repeated till the sensitiveness of the watch at that pole was nearly extinguished, when the same thing was tried with the north pole of the watch. After a few trials and comparisons the magnet influence was found to be removed, and the watch readily resumed its work.

HINTS AND USEFUL RECEIPTS FOR WATCH-MAKERS AND JEWELLERS.

SILVERPLATED FLUID.—Dissolve 1 ounce of nitrate of silver in crystals in 12 ounces of soft water; then dissolve in the water 2 ounces cyanuret of potash; shake the whole together, and let it stand till it becomes clear. Have ready some half-ounce vials, and fill half full of Paris white or fine whiting; and then fill up the bottles with the liquor, and it is ready for use. The whiting does not increase the coating powder, it only helps to clean the articles and save the silver fluid, by half filling the bottles.

JEWELLERS' ARMENIAN CEMENT.—Isinglass soaked in water and dissolved in spirit 2 ounces (thick); dissolve in this 10 grains of very pale gum ammonia (in tears) by rubbing them together; then add six large tears of gum mastic, dissolved in the least possible quantity of rectified spirits. When carefully made, this cement resists moisture and dries colourless. Keep in a closely-stopped phial.

JEWELLERS' CEMENT.—Put in a bottle 2 ounces of isinglass and 1 ounce of the best gum arabic, cover them with proof spirits, cork loosely, and place the bottle in a vessel of water, and boil it till a thorough solution is effected; then strain it for use.

TO SEPARATE GOLD AND SILVER FROM LACE, &c.—Cut in pieces the gold or silver lace, tie it tightly, and boil in soap ley till the size appears diminished; take the cloth out of the liquid and, after repeated rinsings of cold water, beat it with a mallet to draw out the alkali. Open the linen, and the pure metal will be found in all its beauty.

TARNISH ON ELECTRO-PLATE GOODS may be removed by immersing the article from one to ten or fifteen minutes, or until the tarnish is removed, but no longer, in the following solution. Rain water 2 gallons, cyanuret potash $\frac{1}{2}$ pound; dissolve and put into a stone jug or jar, and closely cork. After immersion the articles must be taken out and thoroughly rinsed in two or three waters; then dried with a soft linen cloth, or, if frosted or chased work, with fine clean sawdust. Tarnished jewellery may be speedily restored by this process; but make sure work of removing the alkali, otherwise it corrode the goods.

TO MAKE GOLD AMALGAM.—Eight parts of gold and one of mercury are formed into an amalgam for plating by rendering the gold into thin plates, making it red hot, and then putting it into the mercury, while the latter is also heated to ebullition. The gold immediately disappears in combination with the mercury, after which the mixture may be turned into water to cool. It is then ready for use.

JEWELLERS will find the annexed list of silver solders of considerable practical value:—Hard solder, pure silver 16 parts, copper $3\frac{1}{2}$ parts, spelter $\frac{1}{2}$ part. Medium: fine silver 15 parts, copper 4 parts, spelter 1 part. Easy solder: fine silver 14 parts, copper $4\frac{1}{2}$ parts, spelter $1\frac{1}{2}$ part. Common hard solder: fine silver 12 $\frac{1}{2}$ parts, copper 6 parts, spelter $1\frac{1}{2}$ part. Common easy solder: fine silver 11 $\frac{1}{2}$ parts, copper 6 parts, spelter 2 parts. The fusing points of these solders are as follows:—No. 1, 1866 degrees; No. 2, 1843 degrees; No. 3, 1818 degrees; No. 4, 1826 degrees, and No. 5, 1802 degrees.—*Scientific American*.

THE Watchmaker, Jeweller, and Silversmith,

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OUR SECOND VOLUME.

IT is with great satisfaction that we commenced (with our last number) the Second Volume of this journal, and acknowledge with thanks, the considerable increase of support which has been accorded it. The considerable improvement which is evident in its pages is not the result of a day, but that of steady work from month to month since the date of our first appearance.

Representing trades which partake of the character of Arts, the WATCHMAKER, JEWELLER, AND SILVERSMITH is intended to be both an Art journal and a practical trade representative; and although we had at the commencement of the undertaking hoped that our endeavours would be appreciated, nevertheless we must express very agreeable surprise at the general, hearty, and enthusiastic manner in which our pages have been received. The many encouraging encomiums which have reached us from all quarters give us every reason to believe that we are supplying a want which really existed, and can but tend to stimulate us in our endeavours to make the journal a welcome and useful visitor in every establishment connected with the various trades which it represents. True that we cannot possibly accomplish such aims without the assistance of the trade, but the very liberal encouragement which we have so far thankfully received leads us to hope that it will not be withdrawn, but that new supporters will rally around us, and strengthen our exertions, which we assure our readers will be strenuously put forth to render the journal worthy of their support. As this early stage of our career is not a fitting time to claim credit for the little which has been effected by our unceasing labours, we can only say that to "PROMISE LITTLE AND PERFORM THE MORE" is the motto which, though not ostentatiously put forth, has yet engraven itself upon our mental tablet, regulated our past, and will govern our future career. We are proud to possess evidence that our subscribers take an interest in our labours and object, as well as appreciate our endeavour to carry out the principle which we have chosen to govern us.

New professions appear unnecessary, NEW SUBSCRIBERS will be more effective; and we therefore only venture to hope that those who are not already on our list will be enrolled WITHOUT DELAY. With the commencement of a New Volume let us have renewed support, and, with the issue of the THIRD, we trust that our readers will be enabled to recognize the aptitude of our motto, and adherence thereto.

NOTICE TO SUBSCRIBERS.

SUBSCRIBERS whose term of subscription has expired, are reminded that it is necessary for them to forward order for renewal and amount of subscription, if they desire the journal continued to their address.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 81s. per oz. Fine Silver, 4s. 7d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver 4s. 6½d. to 4s. 8d. (variable).

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

- JACKSON BENJAMIN, jun., 229, Broad Street, Birmingham, dealer in fancy jewellery. May 23.
 LIGSWORTH BENJAMIN, Local Place, Castle Road, Scarborough, jet ornament manufacturer and dealer. May 23.
 MARSHALL ADAM, Great Ormond Street, Jarro, watchmaker.
 ROCK DAVID, Commercial Buildings, Normanton, York, jeweller. May 22.
 CAMPBELL ANDREW, 77, Newington Causeway, jeweller. June 2.
 COHEN MARKS LEVI, Hope Street, Hanley, jeweller. May 29.
 HOLDEN ALBERT WILLIAM, Farringdon Road, and St. Thomas Square, Hackney, electro-plate manufacturer. June 3.
 STYCH WILLIAM, Snape Street, Birmingham, and Waterloo Road, Burslem, late Wolverhampton, working jeweller and ironmonger. May 30.
 DAVIS JOSIAH, Wellington Road North, Heaton Norris, watchmaker June 7.
 COHEN SOLOMON and JACOB COHEN, Castleford, near Pontefract, jewellers. June 16. At John J. Freeman's, solicitor, Barnsley, July 7 at 11.
 LEVY JACOB, Middlesborough, jeweller. June 9th.
 SHEPPARD CHARLES, High Street, Lewes, watchmaker. June 15.
 SIDGWICK JOSEPH, Thinford House, Low Spennymoor, Durham. June 9.
 WALKER JOHN, Portland, Nottingham, insurance agent and jewellery dealer. June 15.
 DAVIDS LOUIS EPHRAIM, trading as LOUIS DAVIDS, Great Prescott Street, Goodman's Fields, agent in diamond and other precious stones. June 22. At Lewis & Lewis', solicitors, 10, Ely Place, Holborn, July 14 at 3.
 JACOBS LOUIS, Westmoreland Terrace, Newcastle, jeweller and general dealer. June 20. At J. G. & J. E. Joel's, solicitors, Newcastle, July 5 at 2.
 KEY WILLIAM HENRY, Lower Arcade, Bristol, watchmaker. June 21. At C. B. Hodgson's, solicitor, 13, Waterloo Street, Birmingham, July 10 at 11.
 KEY FREDERICK, 3, Howard Road, Handsworth, electro plater. June 19. At Hawkes & Weekes, solicitors, Temple Street, Birmingham, July 5 at 12.
 MEDES JOHN SIDNEY, Cambridge Street, Southsea, jeweller and agent. June 23. At George H. King's, solicitor, 43, North Street, Portsea, July 11 at 4.
 OSWIN WILLIAM HENRY, trading as W. H. OSWIN & Co., 7, Thomas Street, Shudehill, Manchester, jeweller. June 24. At Queen's Hotel, New Street, Birmingham, July 10 at 12. A. D. Edwards, solicitor, 26, Brazen-nose Street, Manchester.
 WELLS WILLIAM HENRY, Stoney Street, Frome, and Marston Bigott, Somerset, jeweller and fancy dealer. June 19. At the Grand Hotel, Broad Street, Bristol, July 10 at 3. Dunn & Payne, solicitors, Frome.

Adjudications of Bankruptcy.

- MILES JAMES and FREDERICK SPORN, 33, Aldersgate Street, jewellers. June 2.
 WELTZLAR GEORGE, 7, Marlborough Road, Dalston, diamond merchant. May 31.

Dividends.

- JAVAN HENRY W. P. (Bkt.), 18, Lever Street, Goswell Road, jeweller. 1st div. 6s.; T. Leighton, 21, Snow Hill, Birmingham.
 FISHER GEORGE (Liq.) Newcastle, jeweller. 1st div. 2s.; E. T. Pierson, 46, Jordan Well, Coventry.
 SCHLINDLER MAURICE (Liq.), Sheffield, jeweller. 1st and final div. 5s. 6d. any Tuesday between 10 and 2; W. F. Tasker, Wharnccliffe-chambers, Sheffield.

Discharges Granted and Bankruptcies Annulled.

- ROBERTSON JAMES WILSON, 100, Aldersgate Street, bullion dealer.
 GLUCKSTEIN M., 22, Artesian Road, Bayswater, jeweller. June 1.

Last days for Lodging Claims.

- OWSTON JOHN (Liq.), Keighley, watchmaker. Claims by July 8, to William Smith, Keighley, auctioneer.

Discharge Granted and Bankruptcy Closed.

- MOSS MARCUS S., trading as MARCUS S. MOSS & Co., Manchester, jewellers. (A div. of 5s. 6d. has been paid.) Bankruptcy closed June 9.

Scotch Sequestrations.

- BARNETT JOHN, Argyle Arcade, Glasgow, jeweller. April 26.

Meeting of Creditors under Scotch Sequestrations.

- MUIRHEAD LEWIS P. & Co., Glasgow, goldsmiths, &c.
 WILSON EDMUND, 108, Rose Street, Edinburgh, working jeweller, &c. W. B. Robertson's, 53, George IV. Bridge, Edinburgh, July 3 at 12. Consider trustee's discharge.

Dissolutions of Partnership.

- McKELLEN S. D. & Co., Market Street, and Stretford Road, Hulme, Manchester, and Bold Street, Liverpool, jewellers. April 29. Debts by Samuel D. McKellen.



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HOROLOGY.

(Continued.)

XV.—DIALLING.

WE ended our last article by speaking of circles and portions of circles in their relation to horology, and that we would explain their functions "in our next." That explanation we now propose to give, preceding it by a further statement which will itself require to be fully gone into at the proper time, namely, CALIPER. Without a fair knowledge of the properties of the circle and its segments, chords, &c., there would, certainly, be little knowledge of caliper. Of course, all our experienced readers are well acquainted with the rules and practice of caliper; but, as we write for the inexperienced as well, we will just merely give its etymology now, deferring further observations until it is reached in its proper turn.

Caliber, calibre, calibro, qualibre, *quá librâ*, caliper, and calliper—for in all these various ways is the word spelt—are respectively from the French, Italian, Latin, and English languages, signify the diameter of a circular body, all being various forms of the Arabic word *kalib*, a model. We also use it in a figurative sense for weight, deducing that application from the Latin word *quâ librâ*. An instrument called caliper-compasses, with a brass index, is used to measure the diameters of columns, the bores of guns, and shot, and also in gauging casks, &c., by excise officers. "I have taken his caliper" is an expression commonly used in respect to our opinion of the qualities of the person who may be under discussion. In watchmaking we know that is used in several ways, from testing pivoting to "striking" out the whole plan of the instrument. Such

is the etymology and such are the meanings of this every-day used and useful word, which we will now leave for the present.

We last spoke of the circle, and mentioned some of its characteristic lines in order to fix them in the reader's mind; we will now proceed to point out more fully its properties to the horological student, for without a knowledge of them he can never in reality thoroughly understand all the principles governing his art.

The greatest straight line in a circle is its diameter, because, in passing through the centre from one side of the circumference to the other, it cuts the circle exactly into two equal parts, that line which is nearer to the centre being greater than the more remote.

It has been found from experience that the most convenient method for the purpose of the practical application of measurements is the division of the circumference of the circle into 360 equal parts, each part being called a degree. Of course the smaller the circle, the smaller are the distances from one degree line to another, and the larger the circle the larger the degree distances. In the early days of scientific investigation no doubt but that these terms were quite sufficient to express all that was wanted. As time, however, laid bare the hidden secrets of philosophy, greater exactitude became an imperative necessity; hence came subdivisions of the degrees. It having been found, again, that 60 being both a multiple and a divisor of 360, it was fixed upon as the equal spaces, into which to divide a degree; thus, the circle had now received 60 times 360, or 21,600 spaces upon its circumference, these spaces, being the multiples of 60, got the name of minutes. Still, mathematical philosophy was not satisfied, and when telescopes showed that even minutes could be divided, that division was made on instruments by a very finely micrometroned cutting engine; these third divisions were called seconds. There was now produced a measurement of the circumference of a circle of $360 \times 60 \times 60$, or 1,296,000 parts;

these parts, be it remarked, could only be made visible on large circles. It was still further proposed to divide the second into sixty, for the purpose of calculation only, and call it thirds. This suggestion, however, was very properly rejected by the astronomers of the time, and a much finer expansion adopted, namely, the decimal notation for all divisions beyond that of seconds. The signs for these various measurements were very sensibly fixed, as a small circle above the figure, thus 45° , the $^{\circ}$ meaning degrees; the $'$ for minutes, and $''$ for seconds. By this it will be seen that 45° , $50'$, $55''$ would mean 45 degrees, 50 minutes, and 55 seconds. Notwithstanding this apparent completeness, it has, nevertheless, its drawback, that drawback being that the minutes and seconds of astronomy are, by the non-scientific, who form the great bulk of the community, and for whose information the scientific work, couched with the minutes and seconds of time.

The young scientific horologist cannot have it too early impressed upon him that the minutes and seconds of astronomy are, respectively, the expressions of measurements of space on the great astronomical circles, and the circles of the sphere. He has heard of quadrants and sextants for taking observations at sea—the latter being now almost entirely used—and the theodolite for land. The sextant, as its name implies, takes in the sixth part of the circle, or 60 degrees, with such subdivisions of minutes and seconds as may be upon it; it deals entirely with marine astronomy in its bearing upon ocean navigation; it measures the altitudes of celestial bodies, and is the scientific working brother of the chronometer. It has a triangular frame, with an arc, or "limb," having the degrees, minutes, and seconds, cut upon it, which arc has, also, a vernier attached to it, to enable the measurements to be read off; it has glasses attached to the frame, through which the observations are taken. The scientific principle governing these instruments is a theorem in catoptrics, or that part of optics that governs the action of reflected light. This principle, in the sextant and other reflecting instruments, is that if an object be seen by reflection from two mirrors which are perpendicular to the same plane, the angular distance of the object is double the inclination of the mirrors. The double of this angle, consequently, gives the apparent altitude of the star or other body observed. By means of the altitude, or distance of the sun, star, &c., and the chronometer, in conjunction with the tables in the nautical almanack, the navigator is enabled to know what part of the globe he is sailing over, and what distance he is from home and from his destined port.

The theodolite, on the other hand, is entirely for use upon land. It is the most useful instrument of the geodetic surveyor. It not only measures angles embracing large surfaces of country, but it also measures the heights and risings of the land from where the surveyor may be making his observations. The name is a compound of two Greek words, *theomai*, to see, and *dolichos*, long. It consists of a horizontal circle, very finely graduated, forming the edge of the plate upon which the other parts of the instrument are built. Upon this plate are two spirit-levels at right angles to each other; the vernier plate has a small telescope for the purpose of reading off the graduations on its rim. Upon two inverted Y's, or frame attached to the axis of the above-named plate, is a large section of a graduated circle for taking vertical angles; that is, for measuring the rise and fall of the land under survey. Over the chord, or cross-bar, of the circle section is another spirit-level, whilst above all is the telescope of the instrument, to the underside of which the spirit-level is attached. The whole has an arrangement of mill-headed screws for the adjustment of the various parts, and rests upon an axis which moves freely round in a collet that is screwed at the junction of three legs, the latter being used to stand the instrument upon when at work. These explanations may help a little towards the comprehension of others of a similar character as they may arise.

The degrees of a circle having now been explained, the student will be sufficiently informed to discriminate whether the minutes and seconds that he may meet with in astronomical reading have reference to time or space. The meaning is, in reality, entirely governed by hour, and degree. Its hour means time, and degree means space, their several minutes and seconds, as a consequence, follow the meaning of the primaries. In order, however, to still further avoid confusion, in many books the words are indicated thus—h. m. s.; and $^{\circ}$, $'$, $''$; as well as $^{\circ}$, $'$, $''$ for space. It may be useful to mention here that these degrees have no relation whatever to the degrees of the barometer and the thermometer; the latter merely having the same name for the sake of convenience.

Arago says that the ancients regarded the circle as the noblest of curves, they having the belief that all the celestial bodies moved in circles. That the circle has always been regarded as a grand department of geometry has been amply proved by the numerous

attempts that have, for generation, been made to what is called "square" it. But the circle obstinately refuses to be squared, notwithstanding the persistent and almost delirious assaults of the great family of the squarers. Books, pamphlets, plates, and diagrams in any quantity have been printed to prove that that particular writer has "at last" succeeded in the great unsolved problem of centuries of mathematical inquiry. Somehow or other a close analysis of the said diagrams of any quantity of curves, angles, and lines, has simply satisfied the "cold-blooded" mathematical inquirer that the circle still stood the circle, that no squaring was possible, and that if it was squared to-morrow, the squaring would amount to nothing in the way of practical work. We may, hereafter, lay the whole of this question before our readers; the details would form a very interesting bit of reading for those who care about such matters.

We have spoken of the diameter of a circle cutting it into two equal parts; thus, on the circle marked in degrees, if one extremity of the diameter passes through zero, the other must pass through the 180th degree, or 90° . Again, if one extremity of diameter cuts the 90th degree, the other will, of a surety, pass through the 270th; because the two extremities must be 180 degrees apart. In all treatises upon wheel-work these principles are strictly adhered to. Take the following, namely, that the circumference of circles are proportionate to their radii. The application of this is very important, as every reader of geometrical elements will understand. We now give it in a very homely way. Take a thread and wind it round the circumference of a circle the radius of which we will call 1. If we wind the same thread round the circumference of a circle whose radius is double that of the former, the thread would be twice as long; if three times the radius, three times as long, &c. This proportion is true, not only to what we have just stated, but, strangely as it may appear, to circles whose radii differed from each other in various proportions. Thus, let us take $1 + \frac{1}{100}$ th, $1 + \frac{1}{1000}$ th, $1 + \frac{1}{10000}$ th, &c., the circumference of the second circle would exceed that of the first by $\frac{1}{100}$ th, that of the third would exceed the second by $\frac{1}{1000}$ th, and that of the fourth by $\frac{1}{10000}$ th.

It will be as well to read these results carefully over, so that they may be remembered when we come to wheel-work, as they will then be found to be of great value. But, stop!—what is this? The printer's "D" says that we have not said one single word about dialling this month, and, as he has not time to be troubled with any more copy, we must wind up. We will probably wind up the dialling next month.

(To be continued.)

EARLY WATCHES.

THE *New York Jewellers' Circular* says:—"Watch" is from a Saxon word signifying to wake. At first the watch was as large as a saucer; it had weights and was used as a "pocket-clock." The earliest known use of the modern name occurs in a record of 1552, which mentions that Edward the VI. had "one larum or watch of iron, the case being likewise of iron gilt with two plummets of lead." The first great improvement, the substitution of the spring for weights, was in 1550. Early watches had only one hand, and required winding twice a day. The dials were of silver or brass; the cases had no crystals, but opened at the back-front, and were four or five inches in diameter.

There is a watch in a Swiss museum only three-sixteenths of an inch in diameter, inserted in the top of a pencil case. Its little dial indicates not only hours, minutes, seconds; but also the days of the month. It is a relic of old times, when watches were inserted in saddles, snuff-boxes, shirt-studs, breast-pins, bracelets and finger-rings. Some were fantastic oval, octangular, cruciform, or in the shape of pearl, melons or tulip, coffins.

THE FRAUDULENT HALL MARKS CASE.

THIS case of inserting old hall marks in new articles of plate, the particulars of which were given in the June number of this journal, has assumed a new phase. Edward Brown, the electro-plater, pleaded guilty to inserting the false bottoms, and judgment was reserved. The Goldsmiths' Company thereupon proceeded against Mr. David Gooch, a silversmith, of New Oxford Street, for whom the spurious articles of plate were made. At the examination at Marlborough Street Police Court, Brown said that Gooch induced him to insert the old bottoms, telling him the manufactured articles would be duly "registered" at Goldsmiths' Hall. Brown strongly asserted his ignorance of any fraud being practised. Gooch was committed for trial, and bail refused.

MASTER HUMPHREY'S CLOCK.

UNTIL a few weeks ago, the original Master Humphrey's clock was to be seen over the door of the late Mr. Humphrey's shop in Barnard Castle, county of Durham. Mr. Humphrey was a clock and watch maker, and rendered great service to Charles Dickens, in supplying him with the materials for his "Nicholas Nickleby," and it was this worthy horologist's clock which suggested to him the title of that book. The Humphreys have in their possession a letter from Mr. Dickens stating this, and a copy of the work containing the autograph of the author. Mr. Humphrey directed Mr. Dickens and his friend "Phiz" to the school which the two travellers rendered infamous by their pen and pencil, but it was by no means the worst of those institutions. The schoolmaster had been very successful in obtaining pupils, and had become very tyrannical and insulting to strangers.

He received Mr. Dickens and his companion with extreme hauteur, and did not as much as withdraw his eyes from the operation of penmaking during their interview.

But "Phiz," who did not dare to display his drawing materials openly, sketched him on his thumb nail, and reproduced him so exactly that soon after the appearance of the novel the school fell off, and was ultimately deserted. Since that period the "Dotheboys" description of school has altogether ceased in the district, although many of the prison-like structures still remain.

The clock was recently purchased by an eminent and wealthy firm of leather factors, George Augus & Son, of Newcastle and Liverpool, and has been sent by them as a present to the Hon. Isaac H. Bailey, of Philadelphia. It was first intended that the clock should be placed in the Centennial Exhibition, but owing to the lateness of its arrival, this matter has been left entirely to the discretion of Mr. Bailey. It is now placed in the office of its owner, No. 17, Spruce-street, where it will tick out the hours and minutes with the same regularity that characterized it in its honoured place, in front of the shop of Master Humphrey; there it will permanently remain unless it should be sent for a period to the Centennial. The clock is a solid structure with a dial two feet in diameter, and the hours marked in yellow Roman numerals on a slate-coloured ground. A massive pendulum swings beneath, and heavy weights move the works. The oaken case with the clock does not accompany it, either because it was too bulky for convenient transportation, or because it was an accessory introduced by the fertile imagination of the author, which is probably the fact.

CLOCK-REPAIRING ACCOUNT.

THE *New York Jewellers' Circular* furnishes us with the following amusing account for clock repairing:—A Worcester gentleman recently sent a very fine French clock to a well-known jeweller to be repaired, saying he wished each item of repairing. The following is a copy of the bill rendered:—

To removing alluvial deposit and oleaginous conglomerate from clock <i>à la France</i>	\$0-50
To lubricating with oleaginous solution the apex of pinions of said clock	0-50
To replacing in appropriate juxta-position the constituent components of said clock	0-50
To adjusting horologically the isochronal mechanism of said clock	0-50
To equalizing the acoustic resultant of escape wheel percussion upon the verge pallets of said clock	0-50
To adjusting the distance between the centre of gravity of the pendulum and its point of suspension so that the vibration of the pendulum shall cause the index hand to indicate approximately the daily arrival of the sun at its meridian height	0-50
Total	\$3-00

A BURMESE EDITOR.—The kingdom of Burmah is at last to have a journal. The king himself is to be the chief editor and proprietor, and the royal penman threatens with the penalty of death all his subjects who will not subscribe to his paper. The method is certainly novel in the way of "working up" a circulation.

THE GREAT CLOCK AT STRASBURG.

ABOUT the middle of the fourteenth century the Canon of Strasburg wished mightily for a clock which should be worthy of the magnificent cathedral wherein he would place it. With this end in view he invited the most learned astronomers and the most skilful mechanicians to vie with each other in producing a clock which should astonish the world and be no shame to the mighty cathedral. A man came forward; and in 1352 the clock was finished. The whole of the Chapter was convoked to behold the first movements of this marvellous machine, which surpassed the most sanguine expectations. A cock perched at the top of a tower flapped his wings a few minutes before the striking of each hour, to warn the faithful against the suggestions of an evil spirit, which the chief of the apostles himself had no power to resist. Then Death came and struck upon a sounding bell as many strokes as the hour required, and an equal number of apostles passed in a lowly attitude before Christ, who placed His hands upon them in the attitude of blessing. Finally the chariot of the sun showed by its course round the dial the months and the seasons; and the hands pointed out the different parts of the day, the days of the week, the days of the month, the age of the world, and the year of our Lord.

When the canons saw all this, their first feelings were of amazement and delight; then they thought within themselves that this man who had been clever enough to make a wonderful clock for them, might make many more and deprive their clock of its celebrity. They immediately determined to deprive the unfortunate man of his sight, and barbarously executed their sentence, not informing their victim until afterwards of the cause of their wicked cruelty. When he learnt it, he cried out, "Oh! foolish men, what have you done? The clock is not finished; one piece is still wanting which I alone can supply, and without which it is quite useless." The man was instantly let to his work, when he seized the main wheel which set the whole mechanism in motion, broke it, and thus stopped the movements of the clock for ever. This is the legend of the first Strasburg clock.

But in 1550 a new clock of Strasburg was to be made, and the most noted mathematicians of the time were called upon to preside over its manufacture. The work was interrupted by the death of some of these. In 1560 it was left solely in the hands of one, Conrad Volkenstein, an astronomer of Hamburg, who entrusted the execution of the different parts of the mechanism to the brothers Habrecht, of Schaffhausen, and the decoration to Tobias Stimmer, of Strasburg. This clock was finished on the 28th of June, 1574. Raufuss' work was restored 1669, by Michael Habrecht, and again in 1732, by Jacques Straubhar. It ceased to act in 1789.

The present clock was commenced by a clever artist of Strasburg, M. Schinque, on the 24th June, 1838, and finished on the 2nd of October, 1842.

The central motive power, which is in itself a clock of wonderful precision, serves to indicate upon a dial-plate, placed on the outside of the church, the hours and the subdivisions, and the days of the week, with the signs of the planets corresponding to them. These indications are repeated inside upon a double dial, one showing the hours, and another devoted exclusively to the calendar, showing the month, the date, the Dominical letter, the saint's day, &c. Two winged beings are seated on each side of the small dial. At each quarter of an hour the right-hand one strikes upon a bell. Immediately the stroke is repeated on all the dials by automata, one representing Childhood, another Youth, another Manhood, and a fourth Old Age. Death, placed upon a pedestal by the side of the old man, strikes the hour, and every time he fulfils his grave mission the second of the two winged figures of which we have spoken reverses an hour-glass.

At mid-day at the striking of the hour a procession of apostles passes before Christ, who places His hands over them in the attitude of blessing; at the same time the cock perched on a tower flaps his wings and crows thrice. On the ground in front of the clock stands a celestial globe, demonstrating the daily and annual motions of the heavens, stars, and planets, with great exactness.

A FRENCH machinist has discovered that by keeping his turning tools constantly wetted with petroleum he was able to cut metals and alloys with them, although when the tools were used without the oils their edges were turned and dulled. The hardest steel can be turned easily if the tools be thus wet with a mixture of 2 parts of petroleum with 1 part of turpentine.

OLD PLATE.

POSSESSORS of old plate may be glad of the following particulars relative to the marks which distinguish old English silver and gold.

MARKS ON SILVER.

The silver marks are various; 1. The maker's mark; 2. The hall (*i. e.* Goldsmith Hall) mark; 3. The duty mark; 4. The date mark; And 5. The standard mark.

The first shows the maker, the second the place at which the piece was stamped, the third the reign to which it belongs, the fourth the year, and the fifth the quality.

More specifically, silver bears five marks: The maker's mark, consisting of the initials of the maker's Christian and surnames; 2. Date mark, a letter of the alphabet, the character of which indicates the year; 3. Duty mark, which is the head of the reigning sovereign, in profile; 4. The hall mark, which is a leopard's head, crowned, for London; five lions on a cross for York; a castle with three towers for Exeter; three castles for Newcastle; an anchor for Birmingham; a crown for Sheffield, and a sword between three wheat-sheaves for Chester; 5. The standard mark, which is a lion passant for silver of sterling quality, or which contains 11 oz. 2 pennyweights of silver in the 12 oz.

MARKS OF THE GOLDSMITH'S COMPANY.

The marks of the Goldsmith's Company are as follows:—1656 to 1675, old English capitals; 1676 to 1695, small Roman letters; 1696 to 1715, the Court alphabet; 1716 to 1735, Roman capitals; 1736 to 1755, small Roman letters; 1756 to 1775, old English capitals; 1776 to 1795, small Roman letters; 1796 to 1815, Roman capitals; 1816 to 1835, small Roman letters; 1836 to 1855, old English capitals; 1856 to 1875, old English small letters.

There is no great difficulty in seeing what sovereign's head is upon the plate, and, to learn the date, this of course must be observed as well as the date mark.

The goldsmiths in England were incorporated so far back as the reign of Richard II., but there is undoubted proof that the English jewellers and workmen had obtained great excellence long prior to that period.

In the time of Henry II., a certain monk had acquired so great a reputation for his works in gold, silver, gilding and jewelling that he was invited by the King of Denmark to superintend his works in gold, and be his banker or money changer.

The business of banking came gradually to be superadded to that of a dealer in the precious metals, and led to the latter being relinquished in favour of the former.

Thus, to give a notable example, Sir Francis Child served his apprenticeship to William Wheeler, goldsmith and banker, and marrying his only daughter, succeeded to his estate and business, from which originated a celebrated banking firm—the oldest now in London—Child & Co., of Temple Bar, Sir Francis was born in 1642. The Earl of Jersey is the principal partner in the banking-house, as representative of his grandmother. This lady, long known as a celebrated leader of fashion in London, succeeded to this inheritance, with a great amount of other property, under the will of her grandfather, Mr. Child. Lady Jersey's mother had eloped with Lord Westmoreland, and Mr. Child was so incensed that he determined to prevent the Westmorelands from benefitting by his wealth. He bequeathed the whole of his property to his grand-daughter—Lady Westmoreland's eldest daughter, who became the wife of Lord Jersey. The elopers were hotly pursued by Mr. Child's direction, and nearly overtaken, when Lord Westmoreland, leaning out of a window, pistol in hand, shot one of the leading horses attached to the pursuer's carriage. It is remarkable that Lady Jersey's own daughter was the last person of consequence married at Gretna Green, having eloped in 1843 with a young officer of the name of Ibbetson. This affair made almost as much noise at the time in the fashionable world as the elopement of her grandfather sixty years before with the heiress of the millionaire banker. The accumulation of plate in the old families in England was only realized in 1862, when an exhibition of art treasures was held in the building of the South Kensington Museum, to which nearly every great family sent liberal contributions. The Earls of Stamford and Warrington were for a long time under the necessity, in order to comply with the terms of an ancestor's will, of buying a certain amount of plate every year, and nearly everything in their house for which silver was at all suitable was made of that metal. The Duke of Buccleugh has a famous collection. He inherits through an actress, who was one of the daughters and co-heiresses of the great Duke of Marlborough, some of the splendid silver ware of that

rapacious warrior, and has, besides, great hoards from various other sources. The Marquis of Exeter, the direct lineal descendant of the great Lord Treasurer Burghley, is also very rich in the same way; his famous "Burghley House by Stamford Town" being filled with valuable articles, many dating from the Lord Treasurer's time. At Knole, a grand old mansion in Kent, formerly the residence of the Duke of Dorset, is a room in which almost every article is of silver or massively overlaid therewith. It was furnished by the then Lord Treasurer—who, it may be fairly inferred, made a good thing out of his post—for James I.'s occupation on a visit.

The plate held in most esteem in England is that of the time of Queen Anne, for which the most extravagant prices are frequently given by amateurs. The universities are rich in silver; but in many of the Oxford colleges they have none earlier than the time of Charles II., having given what they had before to Charles I. to help him in "the troubles." It is the custom for families, when leaving London or England, to send their plate chests to their banker's; and some London firms have immense amounts in their cellars, which have been lying there for years and years. In one case a very celebrated firm some time since proceeded to examine unclaimed chests of plate which had been an extraordinary length of time in its possession, and had, it seemed, been entirely overlooked and forgotten, and the contents were distributed amongst those persons who, after careful inquiry, appeared to have a just claim to them. The turf has given great encouragement to the manufacture of ornamental plate of the costliest description, and the best artists are employed by the leading silversmiths in order to bring this branch of their trade to the highest perfection. The greatest fortune probably ever made by a jeweller was made by Mr. Rundell, of the celebrated firm of Rundell & Bridge, who left considerably over a million of money. It is said, and no doubt with truth, that a great deal of Mr. Rundell's money was made by buying splendid jewels at an immense advantage from French emigrés after 1870.

USEFUL RECEIPTS FOR WATCHMAKERS AND JEWELLERS.

A new compound for polishing and cleaning metals is composed of 1 oz. carbonate of ammonia dissolved in 4 oz. water; with this is mixed 16 oz. Paris white. A moistened sponge is dipped in the powder, and rubbed lightly over the surface of the metal, after which the powder is dusted off, leaving a fine brilliant lustre.

LIQUID FOIL FOR SILVERING GLASS GLOBES, &c.—Lead, 1 part; tin, 1 part; bismuth, 1 part: melt, and just before it sets add mercury, 10 parts; pour this into the globe and turn it rapidly round.

SILVERING SHELLS.—Silver leaf and gum water, a sufficient quantity; grind to a proper thickness, and cover the inside of the shells. For a gold colour, grind up gold leaf with gum water, and apply to the inside of the shells.

TO CLEANSE BRUSHES.—The best method of cleansing watchmakers' and jewellers' brushes is to wash them out in a strong soda water. When the backs are wood you must favour that part as much as possible, for, being glued, the water may injure them.

TO WASH SILVERWARE.—Never use a particle of soap on your silverware as, it dulls the lustre, giving the article more the appearance of pewter than silver. When it wants cleaning, rub it with a piece of soft leather and prepared chalk, the latter made into a kind of paste with pure water, for the reason that water not pure might contain gritty particles.

TO GILD STEEL.—Pour some of the etherial solution into a wine-glass and dip into it the blade of a new penknife, razor, lancet, etc.; withdraw the instrument and allow the ether to evaporate. The blade will be found covered with a beautiful coat of gold. The blade may be moistened with a clean rag or a small piece of dry sponge dipped in the ether, and the same effect will be produced.

A SIMPLE WAY OF HARDENING SMALL WATCH DRILLS.—Heat the tool in the flame of a candle and then plunge suddenly in the candle grease. This is done on account of the drills being so small that they will not retain their heat sufficiently long to enable the operator to remove them from the source of heat to a vessel containing water used for hardening.—*Scientific American.*

AN EXPLANATION OF THE PRINCIPAL TERMS MADE USE OF IN ASTRONOMY.

(Continued from page 27).

BISSEXTILE, or Leap Year, so called by the Romans on account of their reckoning the sixth day of the calends of March twice over. Leap year contains 366 days, which happens every four years, when a day is added to the month of February to make up for the six hours which the sun spends in his course each year beyond the 365 days usually assigned to it. Leap year may be known by dividing the year by 4, and if nothing remain it is leap year, but if 1, 2, or 3 remain it is so many years after.

Cancer the Crab is one of the twelve signs of the zodiac, into which the sun enters about the 21st of June, or upon our longest day. The stars in this constellation are seventy-five in number.

Capricornus, or **Capricorn**, is the tenth sign of the zodiac, into which the sun enters about the 21st of December, or upon our shortest day. Upon the ancient medals it is represented in the form of a goat with the hinder parts of a fish; for the sun entering that sign on the winter solstice, from whence he begins to ascend towards the northern hemisphere, the hieroglyphic sign of a goat, which is fond of climbing and ascends as it browses, seemed to be proper to represent that circumstance.

Cardinal Points are the *east, west, north, and south* points of the compass. The word cardinal signifies principal, chief, supreme. Thus, *cardinal winds* are those that blow from the four corners of the compass. The cardinal signs in the *Zodiac, Aries, Libra, Cancer, and Capricorn*.

In *Arithmetic* cardinal numbers are such as express positively how many things there are, as 1, 4, 8, 10, 12, &c.

In *Morality*, the cardinal virtues are justice, prudence, temperance, and fortitude.

Centrifugal Force is that force by which any revolving body endeavours to fly off from the centre of motion in a tangent to the circle which it describes.

Centripetal Force is that by which any revolving body is made to tend towards the centre of its orbit.

Charles, Wain, consists of seven remarkable stars in *Ursa Major*, or the Great Bear.

Crystalline Heavens is the Ptolemaic system, two solid orbs by means of which the ancients attempted to account for the apparent motion of the fixed stars.

Colures are two great circles, or meridians, one of which passes through solstitial points, *Cancer and Capricorn*, and the other through the equinoctial points, *Aries and Libra*. These circles are imagined to intersect each other in the poles of the world, in the one determining the solstices and the other the equinoxes.

Conjunction is when two stars seen from the sun or the earth appear in the same point of the heavens or answer to the same degree of the ecliptic.

Constellation is a number of stars lying in the neighbourhood of each other, which astronomers, for the sake of remembering with more ease, suppose to be circumscribed by the outlines of some animal, or other figure.

Comets are certain erratic or wandering bodies belonging to our system which move round the sun in very eccentric orbits, and are principally distinguished from the planets by their tails or some hairy or nebulous appearance. When a comet is eastward of the sun and its light marches before it is said to be bearded; tailed, when westward of the sun and the train follows it; and haired, when diametrically opposite to the sun, having the earth between it, and all its tail hidden except a few scattered rays.

Cosmical Rising, or setting of a planet or star, is when it rises with the sun in the morning or sets with him in the evening.

Culminating is a term applied to the sun or a star when it comes to the meridian of any place.

Cycle is a certain period or series of years which regularly proceed from the first to the last and then returns again to the first, and circulates perpetually. The cycle of the moon is a revolution of nineteen years, in which time the conjunctions and lunar aspects are nearly the same as they were nineteen years before. The cycle of the moon consists of twenty-eight years. The cycle of the Roman indication is completed in fifteen years.

Day (natural) is that portion of time in which the earth completes an entire revolution on its axis; this consists of twenty-four hours. It is sometimes called the civil day. An artificial day is the time between the sun's rising and setting, to which is opposed night, or the time between his setting and rising. An astronomical day is the time between two successive transits of the sun's centre over the same meridian, which always begins and ends at noon.

Declination of the sun, moon, or stars, is their distance north or south from the equator, reckoned in degrees, minutes, &c., upon a circle which is perpendicular to it.

Direct.—A planet is said to be direct when it moves according to the order of the signs; as from *Aries* towards *Taurus*, &c.

Disc of the sun or moon is its round face, which on account of its great distance of the object, appears flat, or like a plain surface.

Digit, in astronomy, is the twelfth part of the sun's meridian, which is often used in the calculation of the eclipses.

Diurnal, of or belonging to the day: thus the diurnal motions of the planet are the spaces they move through in a day.

Dominical Letter is that which denotes the Sunday in almanac throughout the year. This letter is usually marked in red. It is named Dominical, from Dominus, Lord.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 273.)

ONE of the Lords Ashton, of Forfar, was a watchmaker in 1763; and it is said that the Earl of Cottenham descended from John Pepys, citizen and clockmaker of London.

At a meeting of the Archæological Institute, held on July 3rd, 1863, the Earl of Mansfield exhibited several exquisite miniatures upon watch-cases of the last century. Among those paintings were portraits of the unfortunate Queen of Denmark, Caroline, sister of George III., and of the famous Streuensee, Prime Minister of Denmark, who was executed, in 1772, for an intrigue with the queen.

On June 4th, 1764, the celebrated watchmaker, Arnold, of Devereux-court, in the Strand, presented to George III. a curious Lilliputian repeating watch of his own manufacture, set in a ring. The size of the article did not exceed that of a silver twopenny-piece. It contained 120 different parts, but altogether weighed not more than 5 dwts. $7\frac{3}{4}$ grs., which were thus minutely subdivided:—The movement complete weighed 2 dwts. $2\frac{1}{2}$ grs.; the great wheel and fuzee, $2\frac{3}{4}$ grs.; the second wheel and pinion, $\frac{2}{5}$ gr.; the barrel and mainspring, $3\frac{1}{2}$ grs.; the third wheel and pinion, $\frac{1}{5}$ gr.; the fourth wheel and pinion, $\frac{1}{10}$ gr.; the cylinder wheel and pinion, $\frac{1}{10}$ gr.; the balance, pendulum, cylinder, spring and collet, $\frac{2}{3}$ gr.; the pendulum $1\frac{3}{10}$ gr.; the chain, $\frac{1}{2}$ gr.; the barrel and mainspring, $1\frac{1}{2}$ gr.; the great wheel and ratchet, 1 gr.; the second wheel and pinion, $\frac{1}{2}$ gr.; the third wheel and pinion, $\frac{1}{2}$ gr.; the fourth wheel and pinion, $\frac{1}{5}$ gr.; the flywheel and pinion, $\frac{1}{10}$ gr.; the fly pinion $\frac{1}{10}$ gr.; the hour hammer, $\frac{1}{2}$ gr.; the quarter hammer, $\frac{1}{2}$ gr.; the rack chain and pulley, $1\frac{1}{2}$ gr.; the quarter and half-quarter rack, $\frac{2}{3}$ gr.; the quarter and half-quarter snail and common pinion, $\frac{2}{3}$ gr.; the all-or-nothing piece, $\frac{1}{2}$ gr.; the two-motion wheel, 1 gr.; the steel dial plate with gold figures, $3\frac{1}{2}$ grs.; the hour snail and star, $\frac{1}{2}$ gr., and $\frac{1}{16}$. For this delicate and exquisite specimen of art Arnold had to make nearly all the tools he used in its manufacture. This tiny watch contained the first ruby cylinder ever made. The king was so pleased with this mechanical wonder that he presented the donor of it with 500 guineas, as a recognition of his artistic skill. Some time after the Emperor of Russia, having heard of the king's watch, offered Arnold 1000 guineas if he would make another like it for him. This Arnold refused to do, so that he might not depreciate the value of his gift, but allow it to remain unique. The *Annual Register* for 1770, and the *Gentlemen's Magazine* for 1771, tell us that on Christmas Day in the former year Mr. Arnold, a watchmaker in St. James-street, presented to George III. a small repeating watch in a ring, the cylinder of which was made of an Oriental ruby. Its diameter was $\frac{1}{16}$ in., its length $\frac{1}{16}$ in., and its weight $\frac{1}{160}$ gr.

Mr. S. Addington has a large oval watch composed of two pieces of rock crystal of octohedral form, 3 in. long and 3 in. wide. The dial shows the hours only; the bell is placed between the dial and the works. It was made at Lünebeck, and is said to have belonged to Louis XIV. Lady Willoughby Eresby has a gold watch with a painted enamel back and portraits of two children and a dog, with gilt chatelaine of chased figures and Louis XIV. scrolls. The maker was Agustin of Vienna. Mr. J. G. Gardner has a gold watch made by Graham, of London, the outer case being *repoussé* with Ulysses and Penelope and Louis XIV. scrolls.

(To be continued.)

COSTLY PLATE FOR JAPAN.—Messrs. Garrard, the Queen's goldsmiths, of the Haymarket, have just completed a most elaborate and valuable service of silver-gilt plate for the Mikado of Japan.

FINGER RINGS

(Continued from page 33).

IN Ben Jonson's comedy, "The Magnetic Lady," the parson, compelled to form a hasty wedding, asks—

"Have you a wedding ring?"

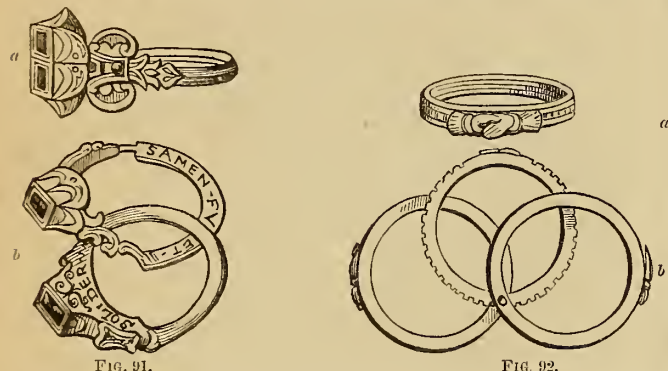
To which he receives an answer—

"Ay, and a poesy;
Annulus hic nobis, quod sic uterque, dabit."

He at once exclaims—

"Good!
This ring will give you what you both desire.
I'll make the whole house chant it, and the parish."

Such rings were known as gemel or gimmel rings, the word being derived from the Latin *gemellus*, twins. The two making one, and, though separate, indivisible, peculiarly fitted them for wedding rings. Their structure will be best understood from the



very fine specimen in the Londesborough collection, Fig. 91. The ring, as closed and worn on the finger, is shown in the uppermost figure (a). It is set with sapphire and amethyst, the elaborate and beautiful design enriched by coloured enamels. The lower figure shows the ring parted (b), displaying the inscription on the flat side of each section, which is also enriched by engraving and niello.

Dryden, in his play of "Don Sebastian," describes such a ring—

"A curious artist wrought them
With joints so close as not to be perceived;
Yet they are both each other's counterpart.
(Her part had *Juan* inscribed, and his had *Zaida*;
You know those names were theirs) and in the midst,
A heart divided in two halves were placed.
Now if the rivets of those rings enclosed
Fit not each other, I have forged this lie;
But if they join, we must part for ever."

A complete illustration of this passage of the poet is afforded in Fig. 92, from the same collection. It also illustrates Dr. Nares's remark that "gimmel rings, though originally double, were by further refinement made triple, or even more complicated; yet the name remained unchanged." So Herrick—

"Thou can'st to me a true love knot, but I
Return a ring jimmals, to imply
Thy love had one knot, mine a triple tye."

This ring (Fig. 92) is shown (a) as it appears when closed; it parts into three hoops, secured on a small pivot, as seen (b), the toothed edge of the central hoop forming an ornamental centre to the hoop of the ring, and having two hearts in the middle; a hand is affixed



Fig. 92.

to the side of the upper and lower hoop, the fingers slightly raised, so that when the hoops are brought together, they link in each other and close over the hearts, securing all firmly.

A mechanical ring of still greater mystic significance is shown

Fig. 93, and is one of the most curious of the Londesborough series. The outside of the hoop is perfectly plain and is set with a ruby and amethyst. Upon pressing the stone a spring opens, and discovers the surface covered with magical signs and names of spirits; among them Asmodiel, Nachiel, and Zamiel occur, a similar series occupying the interior of the hoop. Such a ring might be worn without suspicion of its true import, looking simplicity itself, but fraught with unholy meaning. It was probably constructed for some mystic philosopher, or student of the occult sciences, searching for the philosopher's stone, the elixir of life, and the power given to man to control the unseen world of spirits.



Fig. 94.



Fig. 95.

We close our review of the art of ring making in the sixteenth century with two very beautiful examples. Fig. 94, from the Londesborough collection, has a ruby in a very tall setting enriched by enamel. The sides of the hoop are highly decorated with flowers and scroll ornament, also richly enamelled. The Waterton collection gives us Fig. 95. A gold enamelled ring set with a large turquoise in the centre and surrounded by six raised garnets. This ring is stated to have subsequently belonged to Frederick the Great, King of Prussia, whose cipher is upon it.

We must not, however, end this portion of our history without a reference to the simple but most important "plain gold ring" of matrimony. It was at this time almost universally inscribed with a "poesy" of one or two lines of rhyme. Two specimens are here engraved. Fig. 96 is formed like the badge of the Order of the Garter—with the buckle in front and the motto of the order outside the hoop—within, are the words, "I'll win and wear you." The ordinary form of ring is shown in Fig. 97, and is inscribed, "Let likinge laste." They were invariably inscribed *within* the hoop. Thus Lyly, in his "Enphases," 1597, addressing the ladies, hopes they will favour his works, "writing their



Fig. 96.



Fig. 97.

judgments as you do the poesies in your rings, which are always next to the finger, not to be seen of him that holdeth you by the hand, and yet known by you that wear them on your hands." Such jingling rhymes were in great request, and exerted the ingenuity of poetasters and small wits. In 1624 a small collection of them was printed, with the quaint title, "Love's Garland; or, Poesies for rings, handkerchiefs, and gloves, and such pretty tokens that lovers send their loves." They are generally in double, seldom in triple lines of rhyme. The Rev. R. Brooke, of Gateforth House, Selby, has presented a curious collection of such rings to the South Kensington Museum. The six following poesies are selected from this series, as they are good examples of the average inspirations of ring poets:—

"Scitthe God hath wrought this choice in thee,
So frame thyselfe to comfourth mee."

"United hearts death only parts."

"Let us share in joy and care."

"A faithfull wife preserveth life."

"As God decreed, so we agreed."

"Love and live happily."

The custom of thus inscribing rings continued until the middle of the last century. There is a story told of Dr. John Thomas, Bishop of Lincoln, in 1753, that he inscribed his *fourth* wife's ring with these words:—

"If I survive
I'll make them five."

Horace Walpole says, "My Lady Rochford desired me t'other day to give her a motto for a ruby ring," so that at that time poesies were not confined to wedding rings.

Allusion has already been made to the custom of using rings as receptacles for relics or poisons. The most famed belonged to Cæsar Borgia, son of Pope Alexander VI., both adepts in poisoning. A grasp from the hand wearing this ring ensured a very slow, but certain death; it contained a virulent poison, which found vent through a small spike, and which was so slight in its operation as to be scarcely felt, and not usually noticed by the person wounded during the excitement of the hearty friendship so well simulated. When conspiracies against the life of William of Orange were rife, under the influence of the court of Spain (*circa* 1582), the unworthy son of Count Egmont "had himself undertaken to destroy the prince at his own table by means of poison, which he kept concealed in a ring. Saint Aldegonde (his friend and counsellor) was to have been taken off in the same way, and a



Fig. 98.



Fig. 99.

hollow ring filled with poison is said to have been found in Egmont's lodgings."

Fig. 98 represents a curious Venetian ring, the bezel formed like a box to contain relics. The face of the ring (in this instance the cover of the box) has a representation of St. Mark seated, holding his gospel, and giving the benediction. The spaces between this figure and the oval border are perforated so that the interior of the box is visible and the relic enshrined might be seen. Fig. 99 is another ring of the same construction; it is richly engraved and set with two rubies and a pyramidal diamond; the collet securing the latter stone opens with a spring, and exhibits a somewhat large receptacle for such virulent poisons as were concocted by Italian chemists in the sixteenth and seventeenth centuries.

The elaborate character of design adopted at this time for Venetian rings, the highly artistic taste that governed it, as well as the beauty of the stones employed in settings, combined to perfect *bijouterie* that has never been surpassed. Fig. 100 is a ring of very peculiar design. It is set with three stones in raised bezels; to their bases are affixed, by a swivel, gold pendant ornaments, each set with a garnet; as the



Fig. 100.



Fig. 101.

hand moves these pendants fall about the finger, the stones glittering in the movement. This fashion was evidently borrowed from the East, where people delight in pendant ornaments, and even affix them to articles of utility. Fig. 101 is a ring of silver, of East Indian workmanship, discovered in the ruins of one of the most ancient temples; to its centre are affixed bunches of pear-shaped, hollow drops of silver, which jingle with a soft, low note as the hand moves.

We have already alluded to the old Eastern tale of "The Fish and the Ring," invented some thousands of years since. It has survived to our own day, and is still related and believed by the commonalty to the east of London. In the church at Stepney is a tomb to the memory of Lady Rebecca Berry, who died 1696, in whose coat-of-arms a fish and an amulet appear. She has hence been supposed the heroine of a once popular ballad, the scene of which is laid in Yorkshire; it is entitled "The Cruel Knight, or Fortunate Farmer's Daughter," and narrates how one of knightly rank, in passing a village, heard the cry of a woman in travail and was told by a witch that he was predoomed to marry that girl on her arrival at womanhood. The knight, in deep disgust, draws a ring from his finger, and, casting it into a deep river, vows he will never do so unless she can produce that ring. After many years a fish is brought to the farmer's daughter to dress for dinner, and she finds the ring in its stomach, enabling her to win a titled husband, who no longer fights against his fate.

The civic arms of Glasgow exhibit a fish holding a ring in its mouth. This alludes to an incident in the life of St. Kentigern,

patron of the see, as related in the "*Acta Sanctorum*." The queen who was his penitent, had formed an attachment to a soldier, and had given him a ring she had received from her husband. The king knew his ring, but abided his revenge until one day, discovering the soldier asleep by the banks of the Clyde, he took the ring from his finger and threw it in the stream. He then demanded of his queen a sight of his old love-gift, a request she was utterly unable to comply with. In despair she confessed all to St. Kentigern, vowing a purer life in future. The saint went to the river, caught a salmon, and took from its stomach the missing ring, which restored peace to all parties.

The occurrence of the fish and ring in the arms of Glasgow and in the Stepney monument is "confirmation strong as proofs of Holy Writ" of the truth of these stories in the minds of the vulgar, who would regard scepticism in the same light as religious infidelity.

Memorial rings were sometimes made to exhibit a small portrait, and on some occasions to conceal one beneath the stone.



Fig. 102.

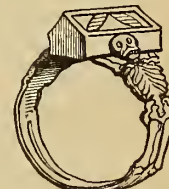


Fig. 103.

Such is the ring, Fig. 102, from the Londesborough collection, which was made for some devoted adherent of King Charles I. when such devotion was dangerous. A table-cut diamond is set within an oval rim, acting as a lid to a small case opened by means of a spring, and revealing a portrait of Charles executed in enamel. The face of the ring, its back, and side portions of the shank are decorated with engraved scroll work, filled in with black enamel. "Relics" of this kind are consecrated by much higher associations than what the mere crust of time bestows upon them, and even were they not sufficiently old to excite the notice of the antiquary, they are well deserving of attention from their exhibiting "memorials of feelings which must ever command respect and admiration." Horace Walpole had, in the Strawberry Hill collection, "one of the only seven mourning rings given at the burial of Charles I." It has the king's head in miniature behind a death's head; between the letters "C. R." the motto, "Prepared be to follow me."

A much more lugubrious memorial is presented from the same collection, Fig. 103. Two figures of skeletons surround the finger and support a small sarcophagus. The ring is of gold, enamelled, the skeletons being made still more hideous by a covering of white enamel. The lid of the sarcophagus is also enamelled, with a Maltese cross in red on a black ground studded with gilt hearts. This lid is made to slide off and display a very minute skeleton lying within.

These doleful decorations first came in favour and fashion at the court of France, when Diana of Poitiers became the mistress of Henry II. At that time she was a widow and in mourning, so black and white became fashionable colours. Jewels were formed like funeral memorials: golden ornaments shaped like coffins holding enamelled skeletons hung from the neck, and watches made to fit in little silver skulls were attached to the waist.

(To be continued.)

BRITISH HOROLOGICAL INSTITUTE.

AT the Annual General Meeting of the above institute, held on the 18th inst., Mr. Jackson, V.P., in the chair, the half-yearly report was presented and adopted.

Twenty-six new members were elected.

The following were duly elected officers of the institute for the ensuing year:—President—Sir Edmund Beckett, Bart., LL.D., Q.C., F.R.A.S.; Vice-Presidents—Jno. Jones, F.R.G.S.; Samuel Jackson, David Glasgow; Treasurer—Thomas Mercer; Council—C. Bacon; T. Baxter; H. Bickley; W. B. Crisp; C. Dunn; J. Evans; G. W. Frodsham; G. Hollister; G. Hooper; M. Immisch; H. P. Isaac; E. D. Johnson, F.R.A.S.; C. Killick; A. Klaffenberger; V. Kullberg; C. Lange; J. A. Lund; G. Mayer; J. Penn; E. Perrett; W. G. Schoof; A. Smythson; R. Strachan, F.M.S.; J. Usher; A. P. Walsh; T. J. Willis.

Votes of thanks were passed to the officers of the past year.

JEWELLERY AND SILVERWARE EXHIBITS AT THE AMERICAN CENTENNIAL.

THE *New York Jewellers' Circular* gives a full description of the jewellery and silverware exhibited at the Centennial Exhibition, and to which journal we are indebted for the following particulars:—

“Beginning with our own city, we give the place of honour to the Gorham Manufacturing Co., which exhibits several special designs in vases and figures from solid silver, and one of the most complete and elegant collections of silverware for general table use, taken directly from the best stock ever brought together.

Their chests of solid silver, consisting of various kinds of spoons, forks, knives, &c., and designed for wedding presents, are in numerous patterns, and all in exquisite taste, and show a finish in detail that is remarkable. These chests, a specialty of the Gorham Co. for the display of their goods, are among the most beautiful things in this line to be seen.

The most perfect taste is displayed in the contrasting colours of the satin linings, and in the finish of the exteriors, which are in oak (Eastlake style), French walnut, sealskin, &c. The most elaborate and prominent object in this exhibit is the “Century Vase,” designed by George Wilkinson and S. J. Pairpoint, and manufactured by the Gorham Co. It measures 5 feet 4 inches in the length of the base, and is 4 feet 2 inches in height, weighs two thousand ounces (2000 oz.) in solid silver, and is valued at 25,000 dollars (\$25,000). It consists of groups of figures and medallions, in bas-relief, all telling the story of our country during the past 100 years, and typifying our progress in the arts and our advancement in commerce, &c. The work is a very spirited one, and displays a fine artistic conception on the part of the designers. A model of a group in wax, bronzed over with silver bronze by Mr. F. A. Heller, of Buffalo, will strike the eye as one of the finest objects this company exhibits. It is about a foot and a half in height, and is entitled “The King of the Prairie,” and represents an Indian woman, a chief's wife, upholding in her arms her infant son to the admiring gaze of the tribe. She is seated on a buffalo, which has its head held low in a vain endeavour to disentangle with its foot a ribbon or band of some kind which has fallen over its forehead.

The wonderful finish of the details of this group, and the perfection of its conception, which is thoroughly national, make it one of the most characteristic things shown. Among other noticeable articles in this exhibit is a Japanese tea set, in satin finish, ornamented by a border in rolled work, called the “Hymen” border, and, of course, emblematical of marriage, and life after marriage. There are three large and five small pieces in the set, all chased by hand, in lines and bands of gold in Japanese designs.

Another new and characteristic design is a set for nuts—a silver dish ornamented with figures of squirrels, and the nut picks having squirrels on the handles. A “christening” set is an expensive and elegant novelty—designed, no doubt, for that rare baby born with a silver spoon in its mouth, we have all heard about, as it is valued at the small sum of 600 dollars. There is a waiter, saucer, plate, bowl, night lamp, saucepan, napkin ring, pap-spoon, &c., all solid silver, in satin finish and highly polished lines, with a charming allegorical border. The case in which it is put up is itself a work of art, being of Russia leather on the outside, and a beautiful combination of ecru and brown satin inside. The coffee, tea, and dinner sets which this house shows in sterling silver are especially to be mentioned for the simplicity and elegance of their designs, and their adaptability for constant use. Some fine pieces of *repoussé* work are exhibited also, such as a portrait of Dickens, and a highly polished salver as clear as a mirror, the border of flowers and fruit *repoussé*.

Passing out of the exhibit of the Gorham Co., one comes directly into that of J. E. Caldwell & Co., of Philadelphia, who display a very fine line of silverware, jewellery, and diamonds. Their specialty in silverware is their “Queen Ann” silver, which is also characterized as “especially Philadelphian,” though Tiffany & Co. have shown the same kind of work in individual pieces, made for their stock during the past year.

The ornamentation is a reproduction of old English chasing, is called hand-made, and is effected by the *repoussé* process. The pieces present a mass of brilliant decorations in raised figures of flowers and foliage, which is rich and showy in the extreme. The shapes are rather more antique than of Queen Ann's time, and are singularly graceful and appropriate. Apart from the richness and effectiveness of the dinner and tea sets shown in this style of work, is first their durability, as it is impossible to scratch or dent their

surface, and second, their saving of labour, as they can be used constantly for fifty years, if possible, without any other cleaning than that obtained from soap and water, retaining for ever the same brightness. The centre of Caldwell's exhibit is occupied by a small case, in which will be found two of the largest diamonds in the Exhibition, and a necklace and earrings of single diamonds which, if not so large and extensive as others shown, are noticeable for the purity of the stones and the care with which they have been cut and set. The solitaires mentioned as among the largest in the Exhibition, are of 42 carats weight.

The line of jewellery which this house calls attention to is taken directly from stock, and consists of necklaces, pendants, earrings, and brooches, bracelets, &c., in solid gold, with settings of diamonds and other precious stones and cameos, all elegant in design and of the best workmanship. A novelty in a lady's pin for a lace scarf or veil, though but a mere trifle, is perfectly exquisite. It represents a white moss bud with leaves, the bud being almost entirely silver, just enough gold being mixed with it to slightly colour it, while the petals of the flower and the leaves are in shaded gold of green and yellow. In their cases are also some new goods in enamels on gold, little sets of brooches and earrings; the brooches are either a single violet and a field flower in their natural colours, or a bunch of violets with leaves of burnished gold, or a large Parina violet with a diamond in the centre, the earrings matching. Nothing could be prettier than the designs offered.

Tiffany & Co.'s (New York) exhibit is on another side of the same pavilion, and is characterized by variety and richness, and by the excess of silverware it displays over jewellery. The place of honour, however, is given to their diamonds, which are in a case standing in front of the entrance. They consist of a necklace and earrings of solitaires, and one ornament for the hair, made in the form of a feather having an enormous Brazilian diamond on the tip of it. A necklace of pearls is in the same case, of five strings of small pearls, beautifully white, and well-matched, also some very large pear-shaped pearls and rare opals. Other rare pieces of jewellery are found here, such as a rose made of diamonds and pearls, and an exquisite set of pearl ornaments. Little else is shown outside of this case in the way of costly jewellery, though some in moderate-priced ornaments in an adjoining case are very fine, such as earrings and brooches, necklaces, scarf-pins, &c., in entirely new designs in raised gold work of different colours, red, green, and yellow gold being mixed with platinum in very effective combinations. The designs are all strictly Japanese, and are very unique. In several a figure is seen blowing bubbles, the bubbles are represented by pearls and opals, the bubble coming from the pipe being an elongated pearl or opal, with apparently the bright glow of the sun upon it. In the favourite conch shell ornaments they have several new styles for bracelets and necklaces, in carved beads, with pearl settings transversely connecting them.

Tiffany & Co. have revived, with excellent effect, in the ornamentation of table silver, and also in larger designs, the old niello decoration, a metallic enamel in black used in the ornamentation of various kinds of metals before the art of engraving was invented. They show a very exquisite specimen of the work in a “communion service,” Gothic in style, with the lettering and ornamental lines in niello. The “nef” style of the sixteenth century is also illustrated in a table design for fruit or flowers in the shape of a sailing ship of hammered and *repoussé* work.

The most wonderful specimen of *repoussé* work they exhibit is a tea set of five pieces, Persian in outline, with the flowers and foliage so beautifully brought out, that a botanist could classify every leaf and flower.

It is impossible in our space to enumerate the many novelties they exhibit in the way of silverware, Assyrian, Indian, Russian, Greek, and North American, in designs and outline, and ornamented in every known style of modern and ancient decoration.

Starr & Mareus, of 22, John Street, New York, complete this admirable quartette. Their exhibit is small but extremely rare and costly, and consists entirely of gems in diamonds, cameos, &c., in three small cases. A diamond necklace, pendants, and solitaire earrings, a number of fine pink orientals, pearls and diamonds, set as an aigrette, and a brooch of delicate pink coral cameos, and a necklace of pink coral beads of rare perfection, fill the first case. The second is occupied by a superb collection of cameos and intaglios; and the third case by a collection of cameos, also selected and set by this house for the wife of a New York merchant. The cameos are not only very remarkable, but the settings are also heavy and massive in rich *cloisonné* enamel, and of the most elaborate and splendid character.

Bailey & Co., of Twelfth and Chestnut Streets, Philadelphia, adjoining this centre pavilion make a small but very rich display.

They show in the centre a case of unset cameos, that they have been years in collecting, and which are not excelled by anything of the kind in the Exhibition. They are the very perfection of cameo cutting, and are both mythological and historical; the most perfect likenesses appearing among them of well-known characters in history. They also exhibit a magnificent necklace and cross, and brooch and earrings, of diamonds. The diamonds are not very large but of the very finest quality. Specimens of the "Queen Anu" silver, similar to Caldwell's exhibit, fill another case.

With these few houses the most important part of the United States exhibit is covered.

GREAT BRITAIN.

Great Britain is represented in silverware solely by the world-renowned house of Elkington & Co., London, who make a most noticeable display of art works in gold, silver, and other metals; plain table plate in solid silver, and electro silver; decorative table plate relieved with electro gold and oxidized silver; *cloisonné* and *champ-levé* enamels on silver and copper, and a number of antique art treasures in metals from the South Kensington Museum. The centre of the exhibit is taken up with one of the most elegant and elaborate pieces of *repoussé* work in silver and steel probably ever constructed, and is from the hands of M. Morel Ladeuil. It is entitled the "Helicon Vase," and is illustrative of music and poetry, and was six years in process of making.

It is not possible for us to attempt to do justice to the fulness and beauty of the design, or the perfection of the technical execution. It is a masterpiece of skill and rare artistic conception.

The second important work that catches the eye is the "Milton Shield," a *fac-simile* copy of the original, which was manufactured for the International Exhibition of Paris, in 1867, and purchased by the English Government at a cost of 15,000*l*. The subject is taken from the sixth book of Milton's "Paradise Lost." The present copy has been reproduced by the electrotype process, and shows the most exquisite finish. The original work was, like the "Helicon Vase," in silver and steel, with enrichments of damascened gold, and wrought by the *repoussé* process. Morel Ladeuil was also the artist.

The "Pompeian Toilet" is a plaque about twenty inches in diameter, made especially for this Exhibition, and is the latest work of the artist of the two foregoing specimens. It is similar in materials and wrought by the same process. It represents a Pompeian lady at her toilet, and is valued at 7500*l*. The gilt and oxidized tables of this firm are among the most beautiful things the fancy can conceive; the other articles for house decorations they show are of most graceful forms, and almost oriental in their rich decorations.

The one style of damascene tracery in gold, and the combination of highly coloured gold and silver, runs through everything, imparting a barbaric splendour to the exhibit that is perfectly dazzling. We need palaces to put these things in, and kings and queens to buy them, for though named for domestic use they are really art treasures that the eye delights to rest upon, but the fingers fear to handle. With these beautiful specimens of the art of the silversmith the English exhibit of silverware closes. It is to be regretted that none of the other Great London houses have honoured us. Their absence is even more noticeable in the jewelry department, where, with the exception of Mr. John Neal and Mr. John Jefferys, and Francati and Santamaria, who offer a very fair collection of gold and silver jewelry, precious stones, &c., the great jewelry centre of London remains wholly unrepresented.

Mr. Gibson's display comprises the most exquisite and choice display of precious stones and ornaments to be found in the building. Though his exhibit does not cover much space, it has been estimated to represent more money than any similar exhibition. This is accounted for by the special beauty and value of each piece of work and the choice manner in which they are displayed. The designs seem to be altogether original, and are specially marked by a refinement of fancy and chaste daintiness of taste which gives to the whole character of the exhibit a certain elegance that is very attractive. A set of diamonds and emeralds here shown is valued at about 20,000*l*. The emeralds are said to be the finest exhibited. The diamonds are of the purest water, though small, and show to great advantage in their setting of silver.

Noticeable in this case are the number of fine pink corals set in brooches and bracelets, with diamonds and pearls, and also in a very fine contrasting setting of blue enamel. The solid goodness of every piece in this display, and the number of fine precious stones of all kinds that it embraces, places it among the prominent features of the whole exhibit. Naturally it also embraces bog-wood ornaments of all kinds, set in gold, such as are rarely seen in this country. Mr.

James Aitcheson, of Edinburgh, has a characteristic display of Scottish jewelry in gold and silver, and Highland ornaments and stones (earrings) found in Scotland; and Mr. Charles Byran, West Cliff, Whitby, displays all kinds of ornaments of the celebrated Whitby jet.

FRANCE.

The display here of gems and fine gold ornaments is equally meagre, and chiefly noticeable for the absence of well-known Paris firms. Fils Boucheron, 152, 153, and 154, Palais Royal, Paris, exhibit 80,000*l*. worth of diamonds, made into a coronet and necklace of very elaborate pattern.

The stones are small and not well matched, and the design and setting not effective. The contrast of our own settings in diamonds is in no place so strongly brought out as here. While this parure represents a good round sum in dollars, it does not much exceed in effectiveness its paste sisters around it, and this may be as much attributed to the clumsy manner in which the gems are mounted as to their lack of brilliancy. In any one of the American diamond exhibits, the radiant style in which their best points manifest themselves with their airy, limpid appearance, is almost too much to put into words, and cannot but strike a prejudiced beholder.

MM. Boucheron also show a number of costly diamond ornaments in the form of sprigs and flowers, some very fine pearls in pink and smoke colour, said to be the largest exhibited; gold ornaments, very massive and showy, and a coral set, necklace and hair ornaments, unique and striking in design.

M. A. Fornet exhibits a novelty in the way of transparent enamel jewellery, very pretty and not expensive, the sets selling from 24*l*. upwards. He has already disposed of all his specimens. The ornaments have the appearance of being encrusted with various kinds of stones of different colours, which is, however, the enamel very cleverly put on, on an open ground of variegated enamel. As the articles are showy and pretty, and what is called "becoming," they are destined to have an ephemeral success with the ladies.

Emile Philippi, Paris, shows some Egyptian jewels (scarabæes), from authentic sources; and Clerneut & Co., Paris, a fine collection of pearls and diamonds. Outside of this there is not much more to note, except the number of dealers who make exhibits of gilt and imitation and stage jewellery, and imitation precious stones.

ITALY.

Ettore Geraldine, Rome, exhibits a rich and varied collection of all kinds of costly jewellery and precious stones. The special point of his display is the exquisite sets of Byzantine and Florentine mosaics.

C. Salvo and Sons, Genoa, and Emile Forte, Genoa, show some of the finest specimens of gold and silver filigree work which it is possible to imagine, personal ornaments of all kinds, and card-receivers, card cases, boxes, &c. The workmanship of these articles is of the very finest description, the colouring warm and rich, and the designs graceful and artistic, altogether exceeding the exhibits of this sort of work made by Portugal and Sweden.

Giuseppe Giouizza, Naples, has the finest collection of coral displayed in beads, necklaces, bracelets, brooches, and earrings, combs and hair ornaments. He numbers in his collection many of the largest pieces of coral to be found. One, a head set as a brooch, is almost two inches in diameter, and richly encircled with pearls. This is kept for private inspection only, as is also a rare necklace in the beautiful pale pink coral, so difficult to obtain, valued at 1000*l*. It is Pompeian in design, and set in fine filigree work, and was ten years in making on account of the trouble and time it cost to match the corals.

Niccolo Bellezza, Rome, exhibits a very costly and striking collection of jewels and ornaments. Specially noticeable are a necklace of intaglios in Egyptian design, and some Roman ornaments for the neck of very singular shape; a collar of diamonds and pale pink rubies, valued at 20,000*l*., and a large turquoise, said to be worth 2000*l*. Also a gold filigree collar for a lady, set with large pearls, pink rubies and diamonds encircling the pearls, and fastened in front with a slide, which imitates a cord and tassels, the tassels being formed of pear-shaped pearls; the pattern is very unique.

Alessandro Castellani, Rome, exhibits, in a small case, some *fac-similes* of antique jewels, which are very interesting, ancient sards, with intaglios and cameos, and a necklace of engraved emeralds. Signor Castellani has also a collection in one of the small rooms of the Italian department, in Memorial Hall, which will delight the lovers of the antique gold ornaments of the ancient Lombard style, bronze and silver ornaments of military use by the Crusaders in the eleventh, twelfth, and thirteenth centuries; gold ornaments taken from the "Cemeteries of Etruria," and from the "Cemeteries of Cere,"

700 B.C.; Phœnician ornaments; sixteenth century jewellery, and gold Italian, Greek ornaments from Tarenton, 350 B.C., are there to be seen, besides a number of fine cameos and intaglios.

SWEDEN AND NORWAY.

P. A. Lie exhibits a case of ornaments in silver filigree work, the designs of which are very simple, though the execution is extremely fine, also several pieces of work in solid silver. J. Tostrup, Christiana, Norway, also exhibits silverware, such as a centre piece for fruit and flowers, coffee spoons, candlesticks, &c. The extreme beauty and finish of the work has surprised every one who has seen it.

PORTUGAL.

Little Portugal makes a very fine collective display of gold and silver filigree work, quite artistic in design, and very nearly equal in work and finish to the Italian display. She also shows some toilet sets in solid silver.

GERMANY.

Germany's exhibit consists of two collective displays of gold ornaments, precious stones, and silver and plated ware. Out of the fifty exhibitors who contribute their mite to this poor display, there are but two or three names which are even deserving of mention, and these are C. Bessinger & Sons, and C. Hertel & Sons, Hainault, and H. Keller and Wild & Co., from Pforzheim, Bessinger & Sons especially, showing two very beautiful sets, one in diamonds and pearls, and the other in turquoise diamonds and pearls. The rest of the exhibits can only be characterized as mean and poor in the extreme, consisting of the cheapest kinds of gaudy ornaments, set with the cheapest kinds of stones in all the colours of the rainbow.

AUSTRIA.

Markowitsch & Shera exhibit a case of silver ornaments in niello enamel, very striking in design. Michael Goldschmidt (P. Bessinger, 13, John Street, New York, agent) exhibits a large case of gold and silver ornaments thickly set with garnets. The case is filled with the same style of jewellery.

M. Kuch, Prague, shows a small case of real Bohemian garnet jewellery, similar to the above. Joseph Zasche, Vienna, has a very pretty and effective collection of porcelain and enamel jewellery, figures and flowers on a black ground.

RUSSIA.

Here will be found, to the surprise of everybody, two collective exhibits of some of the very finest silverware in the Exhibition; not only unique in design, but remarkably original and different from anything in silverware the world has ever seen. The exhibit is a collective one and not large, only filling two cases, and consisting of massive drinking pitchers or tankards, cake baskets, and a number of small ornaments. The baskets are in electro gold, and imitate plaited straws, and have thrown over them a fringed damask, wrought in silver, with groups of figures in relief upon three sides of them. The most careful work is shown on every piece exhibited, the *repoussé* process, *cloisonné* and niello enamels being used with great effect, and with taste and judgment.

W. Adler, Moscow, has a case of coloured gold ornaments of very original designs; burnished leaves with bugs as jewels upon them, and a moss-rose and leaves, the bud being one large pearl.

Otto Krumbregal, Moscow, exhibits some costly stones in necklaces and ornaments, and an aigrette in diamonds and pearls which is a perfect blaze of light. All the jewellery designs shown by this and other Russian firms differ from other countries, and is well worth inspection.

SWITZERLAND.

Petit, Pierre & Bryson, and Sharneck & Co., both of Geneva, exhibit ten small cases of watch chains, and gold brooches and earrings of very ordinary designs.

BRAZIL.

Nalte has a small case of Brazilian scarabæes and other insects, set and unset. Further than this there is no exhibit of the native wealth of the country in precious stones. It is a matter of great regret that the superb collection of diamonds sent by this country could not have been entered, as they would have added wonderfully to the interest of this section of the building.

SPAIN.

This country has a collective display of silver ornaments, plain and in enamel, not noticeable for the work or design.

The above notes give a hasty yet comprehensive view of what is to be seen at the great Exhibition in the way of jewellery. The department of watches we shall treat of in a separate article."

HISTORY OF ASTRONOMY.

(Continued from page 31.)

FOR want of a just idea of the *Solar System*, many phenomena of the planetary worlds were inexplicable to the ancients. Of these, their direct and retrograde motions, and their becoming at times apparently stationary, was no trifling difficulty. Appollonius, of Perga, endeavoured to explain this phenomenon by cycles and epicycles, or circles within circles; but this contrivance afforded by no means a satisfactory solution.

In Alexandria, that celebrated city of Egypt, founded by Alexander, a school for the cultivation of the sciences was established by Ptolemy Philadelphus; astronomy was assiduously attended to by the students, until its destruction by the Arabs, A.D. 642, after it had subsisted upwards of 900 years.

Vigorous endeavours were, from time to time, made to introduce the rational system of Pythagoras, but vulgar prejudice still prevailed. Aristarchus, of Samos,* who flourished about three centuries before Christ, was one of these enlightened philosophers. B.C. 281, he observed the solstices, and proposed a method for determining the distances of the sun and moon. Eratosthenes, of Cyrene,† who flourished a little later, was royal librarian to Ptolemy Evergetes, and constructed armillary spheres,‡ which were afterwards so successfully employed by Hipparchus, and others. Archimedes, of Syracuse, so celebrated for his geometrical and mechanical skill, was likewise an eminent astronomer.

But none amongst all the ancient sages is to be compared with Hipparchus, of Nice,§ in Bithynia, for astronomical discoveries and just views of that wonderful science, who wrote about 140 years B.C. Although he entertained the erroneous idea that the sun and planets moved round the earth as their centre, he discovered that the time from the autumnal to the vernal equinox was seven days longer than from the vernal to the autumnal. He formed tables for the equation of time, on the difference between the real and apparent time, the latter being indicated by a sun-dial. He explained the different motions of the moon, and accomplished the difficult and laborious task of making a catalogue of the stars, marking their distances, and showing the means whereby their precise places on the hemisphere of Alexandria might be known. He calculated, likewise, all the eclipses that were to happen for 600 years. As he makes no mention of comets, it is supposed, either that he never saw one, or that he considered them merely as meteors. Hipparchus is said, likewise, to have discovered the parallax of the heavenly bodies, or the difference of their situation, as viewed from the centre of the earth, and any point on its surface. This discovery has been of great importance to astronomy.

At Rome this science was not neglected. Posidonius, of Ampaniæ, in Syria, though he usually resided at Rhodes, taught astronomy occasionally in that metropolis. He was contemporary with Cicero and Pompey, the former of whom speaks very highly of a celestial sphere constructed by him. About the same time Cleomedes wrote a treatise on the sphere, the motions, periods, distances, and magnitudes of the planets, and on eclipses; and although he gathered all his knowledge from the writings of preceding astronomers, and from actual observation, his work is valuable as preserving those writings and handing them down to us, which would otherwise have been lost. His opinions respecting refraction, the relative distances of the sun, moon, and stars, and their magnitudes, approximate to the truth.

The Romans began early to understand the nature of eclipses, and the method of calculating them, and thus they prevented the superstitious terrors which sometimes paralyzed the strength of armies where they happened; thus Sulpitius Gallus foretold the eclipse which took place the night before the battle, in which Perseus, king of Macedon, was defeated by Paulus Emilius. It is probable that this event contributed to the victory, for the Romans being forewarned were not alarmed, whilst, it is probable, the phenomenon damped the courage of the enemy.

Nor did men of the highest rank, and whose ambition might have been supposed sufficient to occupy all their attention, neglect this science. Julius Cæsar studied it and reformed the Calendar of Numa. Cicero is said to have been a skilful astronomer, and Varro was the first that made use of eclipses to regulate chronology.

* A small island in the Mediterranean Sea.

† Cyrene, the capital of Cyrenaica, and one of the cities called Pentapolis, in Africa.

‡ An armillary sphere is composed of several brass circles, which represent those of the horizon, meridian, ecliptic, &c., drawn on the globe.

§ Bithynia, in Asia Minor, now Asiatic Turkey.

In the reign of Augustus, Caius Manilius wrote a poem, entitled *Astronomicum*, which contains much that is valuable, but it is debased by the reveries of Judicial Astrology; and Monelaus, A.D. 50, assisted the science greatly by his discovery of the principal theories in spherical trigonometry.

In general, however, the Romans paid little attention to astronomy, and the science fell almost into desuetude, until the study of it was revived by Ptolemy, a native of Ptolemais, in Egypt, and a professor in the school of Alexandria, about A.D. 140. He collected, and reduced into a regular treatise, the substance of the writings on this subject then extant, and enlarged the work by observations of his own. This volume was called by the Arabs, *Almagest*, and by the Greeks *Megalá Syntaxis*, or the Great Syntaxis. It supports the erroneous opinion which still prevailed, that the earth is the centre of the universe, and endeavours to account for the phenomena of the heavenly bodies by means so complicated that they can, with difficulty, be understood, and so remote from the beautiful simplicity of nature that it is astonishing it could have had any advocates among the wise and learned. It was, however, universally received, and so greatly admired that, though by no means new, it was denominated the Ptolemaic System.

As we have already mentioned, the Alexandrian school was broken up, and its library destroyed, when the city was taken by the Arabs, A.D. 642. The books were so numerous, that though they were distributed among the 4000 public baths in the city, as fuel to heat them, it was six months before they were all consumed. The *Almagest*, of Ptolemy, escaped the general wreck, and was translated into Arabic, A.D. 827, and into Latin about 1350; the manuscript is said to be still extant in the library of All Souls College, Oxford. Ptolemy wrote likewise a Geography, in which the situations of places are, for the first time, pointed out by their latitudes and longitudes.

(To be continued).

THE DEPRECIATION OF SILVER.

THE report of the Select Committee on the Depreciation of Silver, prepared by Mr. Goschen, the chairman, was issued on the 10th inst. It occupies fifty-one pages. The Committee do not make any recommendations with regard to legislation, and they consider that "in view of the many uncertain elements to which they have pointed, and which necessarily enter into every calculation as to the future, they are not authorized to offer any further opinion as to the probable course of the silver market, beyond indicating, as they have endeavoured to do, the various circumstances which have to be taken into account." The Committee are of opinion that the evidence taken conclusively shows that the fall in the price of silver is due to the following causes:—

1. To the discovery of new silver mines of great richness in the State of Nevada.

2. To the introduction of a gold currency into Germany in place of the previous silver currency. This operation commenced at the end of 1871.

3. To the decreased demand for silver for export to India.

4. That be added—

5. That the Scandinavian Governments have also substituted gold for silver in their currencies.

6. That the Latin Union, comprising France, Belgium, Switzerland, Italy, and Greece, have since 1874 limited the amount of silver to be coined yearly in the Mints of each member of the union, suspending the privilege formerly accorded to all holders of silver bullion, of claiming to have that bullion turned into coin without restriction.

7. That Holland has also passed a temporary Act, prohibiting, except on account of the Government, the coining of silver, and authorizing the coining of gold.

With regard to India and the East, the Committee say:—

So much must depend upon the prosperity of the populations, on the abundance of the crops, in fact, on their powers of production, that it is impossible to make any forecast; and, as regards actual facts, no more can be stated than, on the one hand, they have always possessed a very large power of absorbing bullion, while on the other, that power has been diminished by the growth of the sums annually payable by India to the Home Government. The only facts in any calculation as to the future which are certain, and appear to be permanent, are the increased total production of silver, and the effect caused by the necessity of the Indian Government to draw annually for a heavy amount. Both are adverse to the future value of silver, as far as they go; but they may be partially counter-balanced by changes in the trade with the East.

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

ASHER ASHER, 27, Sunderland Street, late Blandford Street, Newcastle, jeweller. June 24.
CORRALL EDWIN, Hanley, Staffs, watchmaker. June 29.
GREEN RICHARD ANGELL, 82, Strand, jeweller. June 26.
HARRIS LAZARUS, 35, North Street, Cheetham, Manchester, jeweller and general dealer. June 29.
MARSTON THOMAS, Joseph Street, Burslem, late King William Street, Coventry, watchmaker. June 26.
ROMBACH GEORGE, Canon Street, and Dean Street, Aberdare, watchmaker. June 28.
CARTER ROBERT, jun., 78, Tottenham Court Road, late 53, Blackfriars Road, jeweller. July 1.
DUGDALE WILLIAM, Friargate, Preston, watchmaker. July 7.
FOXALL GEORGE, Beckenham, late Thavies Inn, London, jewellery factor. June 27.
HANDS WILLIAM, Mott Street, Birmingham, electro-plate manufacturer. July 4.
MUPDEN EDWARD, Snargate Street, Dover, jeweller. July 8.
BARFOOT CORNELIUS HENRY, Huntingdon, watchmaker and jeweller. July 11.
CHINN EDWARD WILLIAM, Huddersfield, jeweller and silversmith. July 14.
NEWMAN ABRAHAM BENJAMIN, 4, Cambridge Crescent, Gough Road, Edgbaston, Birmingham, jewellers' factor. July 13.
PRATT JAMES, 3, Wellington Road, Forest Gate, watchmaker. July 14.
PRICE AARON, 29, Hope Street, Hanley, Staffs, furniture dealer and jeweller. July 8.
DOVEY HENRY, 56, Weston Road, Brighton, jeweller. July 21. At Henry I. Coburn's, solicitor, 54, Leadenhall Street, London, August 14 at 2.
FISHER ANTHONY, 4, Foregate Street, Stafford, watchmaker. July 14.
LANGFORD WILLIAM & GEORGE LANGFORD, trading as WILLIAM LANGFORD & SON, College Green, Bristol, watchmakers and jewellers. July 22. At Barnard, Thomas, Tribe & Co.'s, accountants, Bristol, August 8, at 1. Benson & Thomas, solicitors, Bristol.

Notices of Second Meeting.

WALKER JOHN, Portland Road, Nottingham, insurance agent and dealer in jewellery.
HARRIS LAZARUS, North Street, Cheetham, Manchester, jeweller.
WELLS WILLIAM H., Stoney Street, Frome and Marston Biggitt, Somerset, jeweller and fancy dealer.

Adjudications of Bankruptcy.

WOOLF ALBERT I., 138, Edgware Road, Hyde Park, jeweller. June 27.
CAMPBELL ANDREW, jun., 77, Newington Causeway, jeweller. July 6.
BENNARD WILLIAM, Weston Road, Hastings, electro plater and gilder. July 15.
HUMPHREY HENRY, Brixham, Devonshire, watchmaker. August 19. East Stonehouse.
KIMPTON CHARLES, 14, Sanders Terrace, Blake's Road, Peckham, jeweller, July 21. At Bankruptcy-court, Lincoln's-inn-fields, August 9 at 12. Brougham, Reg.

Dividend.

LUND LAURENTIUS A. W. (Liq.), 60, Chandos Street, Strand, and Cricklewood, jeweller. 1st div. 1s; S. Lovelock, 19, Coleman Street.

Dissolutions of Partnership.

ABRAHAM BROS., 92, Vyse Street, Birmingham, jewellers' factors. June 30.
ASHWORTH JOHN & Co., 20, Thomas Street, Shudehill, Manchester, jewellers. May 19. Debts by John Ashworth.
BARNETT BROS., Vittoria Street, Birmingham, jewellers' factors. May 22. As regards Henry Barnett.
BENNETT M. H. & Co., Wakefield, watchmakers and silversmiths. May 5. Debts by Matthew H. Bennett.
BIDDELL & GUASPARI, 46, Northampton Street, Clerkenwell, goldsmiths and jewellers. May 23.
BIRD & BLOXWICH, Wheeler Street, Birmingham, jewellers.
WEBB C. J. & W. C., 41, Spencer Street, Clerkenwell, manufacturing watchmakers. May 31. As regards W. C. Webb.

Scotch Sequestration.

COGHILL DONALD, Trongate Street, Glasgow, watchmaker and jeweller, trading as D. COGHILL & Co., of which firm he is sole partner. July 13, with protection. Tr., and Com. Faculty Hall, Glasgow, July 21 at 12. Claims by Nov. 13. Agent, J. Fisher M'Laren, 67, West Nile Street, Glasgow.

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MIRROR OF THE MONTH.

AUGUST.

THIS month the Romans named *Sextilis* from its being the sixth in their calendar, before the change was made by King Numa. It, however, retained its original name, until *Augustus Cæsar* gave it his surname, because in it he first became consul, celebrated three triumphs, and ended the civil wars. Since Numa's time, August has continued the eighth month in the year.

The Saxons called it *Arn-monat* (or *Barn-monat*), because they filled their barns with corn. The Saxon word *Arn* signifies *harvest*. They also called it (as well as June) *Woad-monath*.

August was dedicated by the Romans to *Ceres*, the goddess of corn and harvest; and its first Kalend, or first day, was sacred to *Mars*, the god of war. No festival of particular note was celebrated by them in this month. The first of August is denominated in the Christian calendar "*Lammas Day*"; a name which has been variously accounted for, but which is most probably derived from an old Saxon term, signifying *Loaf Mass*, as on this day it was customary for the Saxons to offer an oblation of loaves made of new wheat as the fruits of their corn. They also gave alms of bread on *Loaf Lammas*, or *Lammas-day*.

Our ancestors greatly honoured this month of produce. They mingled merry-making with labour, and rendered the time of harvest a period of universal gladness. They crowned the wheat-sheaves with flowers, invited each other to feast at the housing of the corn, when they danced and shouted, and sung with true glee; and that none might be sorrowful at such a joyous time, they made presents to all who had assisted in getting in the crops. This rural festival was called "*Harvest Home*." It is still the greatest rural holiday in England, because it terminates the most toilsome yet profitable employment of the farmer, and unites repose and profit for the remainder of the year. But modern refinements have unfortunately stripped the merriments of the harvest home of that unrestrained and warm-hearted enjoyment which formerly distinguished them. The master seldom now mingles with freedom and rejoicing in the delights of the harvestmen, but thinks it sufficient if he provides a plenteous feast, and allows them to enjoy themselves in their own way. This change has altered the character of this festival, for the cheering smile of sympathy and the non-distinction of rank or station in these rustic festivities were the chief source of gladness to the honest and humble husbandmen.

Formerly many curious ceremonies were observed by the reapers at "*harvest home*"; they carried images made of straw or stubble, from the harvest field, round which the men and women danced and sang to the lively notes of a piper who followed it. In the north such a figure was called "*Kern-Baby*." In the isles of the Hebrides all the reapers join in chanting a harvest song while they regulate the strokes of their sickles to its notes, thus making the very act of gathering the harvest a festive employment.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 7d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 6½d. to 4s. 8d. (variable).

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

2647. OSCAR M. DRAPER, of North Attleborough, county of Bristol, state of Massachusetts, United States of America, for an invention of "Chain swivels and process of manufacturing the same."—Partly communicated to him by Virgil Draper, of North Attleborough, Massachusetts, United States of America.—(Complete Specification.)—Dated 27th June, 1876.
2728. WILLIAM CHARLES SNEATON CLARK, of Acton Street, Gray's Inn Road, in the county of Middlesex, for an invention of "Improvements in tell-tale clocks."—Dated 3rd July, 1876.
2797. ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, for an invention of "Improvements in keyless repeating watches."—A communication to him from abroad by Ami Louis Junod-Pattus, of Paris, France.—Dated 8th July, 1876.
2852. WILLIAM NELSON, Stamper and Piercer, of Birmingham, in the county of Warwick, for an invention of "A new economic combined ever-point pencil and pen-holder, for the pocket, pocket-book or otherwise."—Dated 13th July, 1876.
2855. ALBERT WILLIAM JONES, of Camden Town, in the county of Middlesex, and HARVEY CHAMBERLAIN, of Hamsell Street, in the City of London, for an invention of "An improvement in solitaires and studs."—Dated 13th July, 1876.
2892. THOMAS MORGAN, Secretary of the Inventors' Patentright Association, Limited, 21, Cockspur Street, Charing Cross, in the county of Middlesex, for an invention of "Improved watch keys."—A communication to him from abroad by John S. Birch, of New York, United States of America.—Dated 14th July, 1876.
2912. HARRISON MILL FRODSHAM, of the Strand, in the county of Middlesex, Chronometer Maker, for an invention of "Improvements in independent equi-motive escapements for watches, clocks, and other time-keepers."—Dated 15th July, 1876.
2913. HENRY MATTHEW ROBOTOM, of Liverpool, in the county of Lancaster, for an invention of "Improvements in the manufacture of keyless watches."—Dated 17th July, 1876.
2958. JOHN ALFRED LANGSTON, of Tavistock Street, Bedford Square, in the county of Middlesex, Architect, for an invention of "Improvements in illuminating clocks."—Dated 20th July, 1876.
2975. GIUSEPPE ZAFFIRA, of Pentonville Road, in the county of Middlesex, Engineer, for an invention of "Improvements in the 'up-and-down' movement for watches, chronometers, and spring clocks."—Dated 22nd July, 1876.

Grants of Provisional Protection for Six Months.

1830. To ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, for the invention of "A combined calendar and time-piece with perpetual automatic adjuster attachment for the irregular number of days in the different months."—A communication to him from abroad by Miner Hamlin Paddock, of East Clarkson, Monroe county, state of New York, United States of America.
2797. To ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, for the invention of "Improvements in keyless repeating watches."—A communication to him from abroad by Ami Louis Junod-Pattus, of Paris, France.
2728. To WILLIAM CHARLES SNEATON CLARK, of Acton Street, Gray's Inn Road, in the county of Middlesex, for the invention of "Improvements in tell-tale clocks."
2865. To ALBERT WILLIAM JONES, of Camden Town, in the county of Middlesex, and HARVEY CHAMBERLAIN, of Hamsell Street, in the city of London, for the invention of "An improvement in solitaires and studs."
2913. To HENRY MATTHEW ROBOTOM, of Liverpool, in the county of Lancashire, for the invention of "Improvements in the manufacture of keyless watches."

Inventions protected for Six Months on the deposit of Complete Specifications.

2578. CHARLES LOUIS AULAGNIER, of Bedford Street, Strand, in the county of Middlesex, praying for Letters Patent for the invention of "Improvements in watches,"—a communication to him from abroad by Vve. de I. Soldano, fils, of Geneva, Switzerland,—was deposited and recorded in the Office of Commissioners on the 22nd day of June, 1876, and a Complete Specification accompanying such petition, was at the same time filed in the said office.
2647. OSCAR M. DRAPER, of North Attleborough, county of Bristol, state of Massachusetts, United States of America, praying for Letters Patent for the invention of "Chain swivels and process of manufacturing the same,"—the true and first invention thereof, except such part has had been communicated to him by Virgil Draper, of North Attleborough, Massachusetts, United States of America,—was deposited and recorded in the Office of the Commissioners on the 27th day of June, 1876, and a Complete Specification accompanying such petition was at the same time filed in the said office.

Notices to Proceed.

2647. OSCAR M. DRAPER, of North Attleborough, county of Bristol, state of Massachusetts, United States of America, has given notice in respect of the invention of "Cabin swivels, and process of manufacturing the same."—The true and first inventor thereof, except such part as has been communicated to him by Virgil Draper, of North Attleborough, Massachusetts, United States of America.
956. And THOMAS WILLIAM GREAVES, Jeweller, of Birmingham, in the county of Warwick, has given notice in respect of the invention of "Improvements in ornamenting solitaires and other articles of jewellery with pressed Glass, and which said improvements are also applicable for other useful purposes."
958. And WILLIAM BAXTER, of Birmingham, in the county of Warwick, and THOMAS GREAVES, also of Birmingham aforesaid, have given notice in respect of the invention of "Certain improvements in studs or solitaires."
1091. And EDWIN POWLEY ALEXANDER, of 14, Southampton Buildings, in the county of Middlesex, Consulting Engineer and Patent Agent, has given notice in respect of the invention of "Improvements in pocket alarms or alarm watches."—a communication to him from abroad by Charles Frédéric Dietz-Monnin, of the firm of Tapy Brothers and Company, of Paris, in the republic of France, Manufacturers.
2578. And CHARLES LOUIS AULAGNIER, of Bedford Street, Strand, in the county of Middlesex, has given notice in respect of the invention of "Improvements in watches."—A communication to him from abroad by Vvede J. Soldans, fils, of Geneva, Switzerland,

Patents Sealed.

464. THOMAS JAMES SMITH, of the firm of Robertson, Brooman, and Company, of 166, Fleet street, in the city of London, Patent Agents, for an invention of "Improved means and apparatus for setting or regulating calendar watches."—A communication to him from abroad by Louis Joseph Crozet, of Rue des Halles, Paris, in the republic of France,—Dated the 4th February, 1876.

Patents which have become Void.

2264. WILLIAM CHARLES ALLDRIDGE, of Birmingham, in the county of Warwick, Manufacturer, for an invention of "Improvements in collar studs, solitaires, sleeve links, and other like dress fastenings."—Dated 30th June, 1873.
2389. FREDERICK CURTIS, of Boston, in the county of Suffolk and state of Massachusetts, United States of America, for an invention of "Improvements in machinery for cutting diamonds or other gems."—A communication to him from Charles Myrick Field, resident at Boston, in the county of Suffolk and state of Massachusetts, United State of America —Dated 10th July, 1873.

Patents Granted in Foreign States.

UNITED STATES.

- 173,782. J. R. GRAVES, of Corry, Pa., assignor of one-half of his right to Jas. G. Foreman, of the same place, for "Watch-jewel as-sorters."—Applications filed 29th January, 1876.
- 173,848. PATRICK DEVER, of Glen Riddle Pa., for "Combined watch charms and keys."—Application filed 27th December, 1875.
- 173,998. G. S. PORTER, of New York, N.Y., for "Buttons and studs."—Application filed 11th January, 1876.—*Brief*.—"The radial arms facilitate insertion in the button-hole, and save material in the manufacture of the button."
- 174,031. J. J. THORNTON, of Cleveland, Ohio, assignor of one-half of his right to D. H. Ridgway, of the same place, for "Safety devices for mainsprings."—Application filed 16th February, 1874.—*Brief*.—"Two springs cut in the upper periphery of a supplementary hoop in the barrel press lightly against the barrel cover and retain the hoop in place."
- 174,122. CHAS. H. DOWNES, of Jersey city, N.J., for "Extension pencil-cases."—Application filed 1st November, 1875.—*Brief*.—"The collar is made so that it will revolve with the extension-handle, and thus prevent scratching. The screw-tube is provided with a polygonal base fitting into a fluted tube, in which also slides the polygonal base of the extension-tube, by which construction the pencil may be projected by turning the extension-tube, whether it is drawn out or not."
- 174,497. CHAS. DOWNS, of Providence, R.I., for "Manufacture of imitation jet jewellery."—Application filed 7th January, 1876.

FRANCE.

- 111,244. MALFAIT, of Paris, for "A clock with visible pendulum."—Dated 29th January, 1876.
- 111,281. RUDEAU, for "Soldering glass, plain or cut enamel on metals for jewellery."—Dated 29th January, 1876.

- 111,494. ESCLATINE, of Paris, for "A gauge for measuring watch-glasses."—Dated 15th February, 1876.
- 111,506. MUIRHEAD, for "Studs."—Dated 14th February, 1876.—(English' Patent, 14th August, 1875.)
- 111,513. SERIN, of Paris, for "Repeating clocks."—Dated 14th February, 1876.
- 111,542. NADAL, for "Improvements in clocks."—Dated 17th February, 1876.
- 111,672. LELEU, for "Clock-bells with slides and jacks."—Dated 23 February, 1876.
- 111,745. SADOUL, of Paris, for "Studs of cuffs."—Dated 2nd March, 1876.
- 111,753. CASPANI, of Nice, for "A clock for controlling public carriages."—Dated 16th March, 1876.
- 111,848. WINNERL, for "A compensating balance, and applying the same to maritime and other precision clocks."—Dated 7th March, 1876.
- 111,850. ANCEAUX, of Paris, for "Improvements in clock-work necessitating less winding."—Dated 11th March, 1876.
- 111,873. DE LAPORTE, of Paris, for "Using gold-plated copper for the manufacture of watch cases."—Dated 10th March, 1876.
- 111,892. GOUJON, of Paris, for "Geographical clocks and watches."—Dated 15th March, 1876.
- 111,931. LEUFAUT, of Romilly-sur-Seine, for "Clock-work."—Dated 23rd March, 1876.
- 112,048. BEGUELIN, of Besancon, for "Stopping the spring of barrilets in watches, regulators, chronometers, clocks, musical boxes, &c."—Dated 15th April, 1876.
- 112,105. FOPARD, for "Watch-keys with fringed metallic glands."—Dated 27th March, 1876.
- 112,267. PIERRET, of Neuilly, for "Combined clock-work, for signalling the striking of clocks."—Dated 5th April, 1876.
- 112,282. BERGER, for "A watch-metronome."—Dated 5th April, 1876.
- 112,296. LEVI, for "Safe mountings of studs."—Dated 6th April, 1876.
- 112,320. DENEURE and BISSEY, for "A toy-watch."—Dated 7th April, 1876.
- 112,336. MARIE and JACOB, for "Ornamenting barrel-clocks and other similar objects by stamping."—Dated 7th April, 1876.
- 112,523. DESLANDES, for "Artificial roses and brilliants for jewelry."—Dated 20th April, 1876.
- 112,536. MATTHEY, for "Regulating watches by the pendant without lateral cams."—Dated 21st April, 1876.
- 112,546. BOURCHER, for "Mounting artificial flowers without shanks, applicable to jewelry, bronze, &c."—Dated 25th April, 1876.

(CERTIFICATES OF ADDITION).

- 103,638. GRUN, for "Spring sleeve-links."—Dated 29th January, 1876.
- 106,458. THE VALLERYSSTHAL AND PORTIEUX GLASS-WORKS COMPANY, for "A lathe for bevelling watch-glasses."—Dated 10th January, 1876.
- 106,572. HERMITE, for "Improvements in watches."—Dated 12th February, 1876.
- 110,281. MARGAINE, for "A remontoir with steady power for circular escapement of clocks, &c."—Dated 1st April, 1876.
- 106,638. GRUN, for "Studs with interior springs."—Dated 14th April, 1876.

BELGIUM.

- 39,885. E. MICHIELS, of Malines, for "An instantaneous electric contact for electric clocks."—Dated 28th June, 1876.
- 39-903. L. GRAINDORGE, of Chokier-Liége-Hollogne, for "A balance applicable to all cylinder watches."—Dated 30th June, 1876.

UNITED STATES.

- 175,057. WILLIAM EISELE, of Marion County, Ind., for "Finger-rings."—Application filed 18th February, 1876.
- 175,230. Gilbert T. Woglom, of New York, N.Y., and LEVI MILLER, of Mont Clair, N.J., for "Lockets." Application filed 9th February, 1876.
- 175,262. HENRY D. STOVER, of New York, N.Y., for "Machines for polishing diamonds, &c."—Application filed 16th March, 1876.
- 175,344. FRANK FISCHLEIN, of Jersey city, N.J., for "Lighting attachments for alarm-clocks."—Application filed 28th February, 1876.—*Brief*.—"The action of the alarm mechanism releases a lever, which brings a rasping surface in contact with a match secured by suitable supporting and gage device above the candle to be lighted."
- 175,494. A. W. PIERSON, of North Attleborough, Mass., for "Lockets."—Application filed 21st February, 1876.

Re-issues.

- 7,002. HENRY J. DAVIES, of Brooklyn, N.Y., for "Clock-cases."—Patent No. 161,211, dated 23rd March, 1875.—Re-issue No. 6,924, dated 15th February, 1876.—Application filed 9th March, 1876.

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HOROLOGY.

(Continued.)

XVI.—DIALLING.

WE intend to devote this article to inclined and reclining dials.

As the name indicates, these dials are drawn on planes that incline or lean forwards towards a southern horizon, the angle of which leaning must be either greater or lesser than the equinoctial plane. We may assume such a dial by supposing a portion of the plane of the equator raised towards the zenith, and the other portion correspondingly depressed towards the nadir; then, further, suppose this plane to revolve upon a line drawn from the east to the west points of the horizon. With these assumptions before us, let us try and convert them into demonstrations by constructing such a dial.

The first thing to be found is the declination of the plane by means of the declinator (already explained), and having done so, draw the declining line, marking it D C. We next produce the equinoctial plane, which we mark C E, and the vertical plane as C B. We must make sure of our declinator problem before we proceed any farther. Having satisfied ourselves upon that point, we draw a horizontal line, L A, touching the lower points of the lines which have been previously produced. Then, if the inclination of the plane falls between the equinoctial plane C E and the vertical one C B, in such a way as that the angle of inclination D C A is greater than the elevation of the equator E C A, on the upper side draw a *north* dial, and on the lower a *south* dial, to an

elevation of the equator, which is equal to the aggregate of the elevation of the equator of the given place, and the complement of the inclination to a quadrant.

We will now proceed, secondly. Construct a line of some length, so that it shall be a tangent, that is, pass over the points of the plane lines that have been already made; let it fall below the horizontal line L A to a length as great as that line, and above it to twice that length; mark this as H G. Then, between the equinoctial lines C E and the horizontal C A, at an equal distance, produce a line, C F. Now, if G F falls between the horizontal line C A and the equinoctial one C E, so as that the angle of inclination, F C A, is *less* than the elevation of the equator, E C A, describe a *horizontal dial*, on the principles already laid down for that construction, to an elevation of the pole of the given place and the inclination of the plane. Bear in mind that dials of the above inclination are drawn according to the same rules as primary dials, with this exception: the index of the horizontal dial must be fitted under the angle A D C, whilst in the primary dial they may be under the angle D F C; the distance of the centre of the dial from the line of contingency is, in the first-named case L C, and in the last-named F C.

Reclining dials are the reverse of inclining dials, and are constructed upon planes that recline, or lean backwards from the zenith towards the north, in an angle that is greater or lesser than the polar plane. The raising and depression towards the zenith and nadir, and the revolution of the plane from east to west, are precisely the same as in an inclining dial. Reclination in dialling carries its primitive meaning with it; but, to be more exact, we say that it is the angle that the plane makes with a vertical plane, intersecting the latter in a horizontal line. Recline, *re*, back, and *clino*, to bend, is to bend backwards from a straight line, such as a horizontal one, for instance;

decline has, practically, the same meaning, whilst incline is to lean forwards. To find the reclamation of a plane we proceed in this wise : draw a horizontal line, and from each end of that line, with a compass pencil, strike two arcs of a circle that will cross each other both above and below the horizontal line. That being done, lay a flat ruler in such a manner upon the paper that a fine pencil mark when drawn will exactly cut through the points where the arcs cross each other. This, in geometrical phraseology, is what is called erecting a perpendicular. According to Euclid, the theorem is that "the angles which one straight line makes with another, upon one side of it, are either two right angles or are equal to two right angles." That is, we have cut the horizontal line into two equal parts, exactly halved it, as it were. Now comes the practical application of the scientific problem.

Instead of lines, let us make the horizontal a piece of flat board, or metal, or slate, and a second one resting edgewise across upon it, as evenly between the ends of the flat board as the line does upon paper geometrically. The reader will now find that he has horizontal and vertical planes—the planes, of course, being the surfaces of the boards. If, now, another board be placed upon the horizontal one edgewise, as before, but *leaning away* from the upright one, that board will represent an inclining, a declining, or a reclining plane, according to which of the two principal planes its position is compared with. It will be *in-clining*, leaning *to*, the horizontal plane, and *de-clining*, or *re-clining* from the vertical one. This is a beautiful demonstration of the union of the scientific and the practical—which, indeed, all Euclid's demonstrations are. Upon this proposition, the 13th of the first book, is founded that valuable instrument, the square, so extensively used by architects, engineers, and nearly all workers in both wood, and stone, and metal. The square is said to have been invented by Pythagoras, as a carpenter's "tool." It will be seen that we have not given Euclid's form of demonstration; this has been omitted for two good and substantial reasons, *i.e.*, those who understand the proposition do not require the Euclidian demonstration, whilst those who do not know would not understand it; *ergo*, in either case it is not wanted.

After some slight consideration, we have hit upon a simple plan which, we think, will enable the student to first lay down the lines of the dial mechanically, and, that being done, he can pursue the geometrical part of it at his leisure.

First of all draw a ——— or horizontal line, of the length desired, then, upon that, erect the perpendicular after the manner that has been previously described, by means of the crossing arcs; but take care and do not cut through the ——— line. At the point where the perpendicular rests upon it mark C, for that will be the centre, and at the extremity B. From this said centre, exactly midway between the perpendicular and horizontal lines, draw another and mark it E. This one will be the angular line of 45 degrees. Now, with a distance on the compasses equal to twice the length of the horizontal line, from E as a centre, produce a straight line that shall touch the extremities of the perpendicular and horizontal lines, and join the points of this straight line by other lines with C. We will call the long line H G, and the joining lines H C and G C. Next, with a distance equal to one-fourth the horizontal line, from B on the long line, draw a line from C and mark the upper end of it D. Again, with the same distance from B to D, draw a line from C that shall be midway between the horizontal line and the 45-degree line, where they touch the long line, and mark it F. Now, notice what we have got on the long or great oblique line that runs from H to G. The half of the horizontal line will be C A, the next C F, the next C E, or the 45-degree line; then C D, the next C B, or the perpendicular, and C H, the reclining angle. That part is completed; and upon consulting it, the student will be able to comprehend all that has gone before in this article. All the lines that we have named are supposed to be on the right-hand side of the horizontal line; two have to be produced on the upper left-hand side to finish the whole diagram. In continuation of the line G C, produce it upwards, marking the extremity K; then, midway between K and H, produce another line from C, and at the upper end mark it I. We have now, on the left-hand side of C B, the lines C H, C I, C K, and C L. This last-named line, L C A, will be seen to be the horizontal line. We have now the materials before us with which to construct any of the dials of inclination that may be required for a reclining dial.

Taking the line H C as a reclined plane from the vertical B C; then, if H C fall between the vertical and the polar plane I C, so that the angle of reclination, B C H, is less than the distance of the pole from the zenith I C B, describe a vertical south and a vertical north dial to an elevation of the equator, equal to the difference between the elevation of the equator of the given place and the angle of reclination. Again, if the reclined plane K C fall

between the polar plane I C and the horizontal one C L, so that the angle of reclination B C K is greater than the distance of the pole from the zenith I C B, describe a horizontal upon it to an elevation of the pole, equal to the difference between the angle of reclination and the elevation of the equator of the given place.

To draw these dials trigonometrically, we have to find the inclination or reclination of the plane and the elevation of the pole. These having become known, the angles made in the centre are to be found by hour-lines. Any dial constructed in this way is, properly, a horizontal dial for a latitude equal to the particular elevation of the pole on the plane of the dial. The angles belonging to it will be found from the instructions previously laid down for a horizontal dial.

We find the elevation of the pole on the dial plane in this way: the plane being inclined, either its inclination is greater than the elevation of the pole of the place, or less; or it is equal thereto. In the first two instances, for upper south or lower north dials, the particular elevation of the pole on the plane is had by taking the difference between the elevation of the pole of the place, and the inclination of the plane. In the second case, the dial is a polar dial, upon which the hour-lines will be parallel; on account of the plane being placed on the axis of the earth, neither of the poles can be represented upon it. For upper north and lower south dials proceed as follows:—If the inclination be greater than the complement of the elevation, the complement of the inclination must be added to the complement of the elevation. If it be less, the inclination must be added to the elevation. If it be equal, the dial will be an equinoctial dial, in which the angles at the centre will be equal to the sun's distance from the meridian. Declined dials are those which both decline and incline, or recline. As we are at this point we will mention that the use of inclined, reclined, and declined dials has become very rare, being now only called into requisition from scientific curiosity. The geometrical and trigonometrical construction of the last-named being somewhat intricate, we cannot give it here; in fact, to do so, we must accompany it by an abstruse article upon astronomical declination. In our last we said something about circles, and circular arcs; following that up, it will be our duty in the opening of our next to introduce the elements of declination so far as they will help to elucidate the subject that we have at present in hand. We do not think that our readers will at all consider the time wasted in perusing it, as we hope to be able to present it to their consideration.

CURIOSITIES OF ANCIENT CLOCKS.

THE old clock in the north transept of Glastonbury Abbey was made, in 1325, by a monk named Peter Lightfoot, at the expense of Adam de Sodbury, who became Abbot of Glastonbury in 1332. This old clock was transferred to St. Andrew's Cathedral, Wells, soon after the dissolution of the abbey. It is divided into 24 parts, corresponding with the 24 hours of the day. The horary numbers, in old English characters on circular tablets, mark the hours from 12 at noon to midnight, and from thence to 12 at midnight again. The hour index, a large gilt star, is attached to the machinery behind a second circle, on which are marked the minutes, indicated by a smaller star. A third and smaller circle gives the age of the moon, which is marked by a point attached to a circular opening in the plate, through which the phases of the moon are shown. Around this aperture is an inscription—"Punctus ab hinc monstrat micro sidericus arcus."

On the opposite side is a circle in which is a female figure, with the motto, "*Semper peragrat Phæbe*." The figures of four knights on horseback, which revolve in opposite directions, were intended to represent a tournament, in mediæval times a very popular amusement. This is the oldest known clock striking the hours with a count-wheel. A figure strikes the quarters with the feet on two small bells within the church. The costume of this figure is of the period of Charles I., and must, therefore, have replaced one of more ancient date.

The motto, "*Semper peragrat Phæbe*" (Phæbe always wanders), crowns the female figure, while the motto surrounding the moon is less intelligible, "*Ab Hinc monstrat micro . . . ericus Archery-pung*." This, it has been conjectured, when perfect, might mean "That in this microcosm are shown all the wondrous of the vast sidereal hemisphere." The sense of the last word is obscure. Some years ago, the original works of this clock being worn out, new ones were substituted. The old works made by Peter Lightfoot are preserved at the South Kensington Museum, but the face still remains.

THE SWISS SOCIETY OF ARTS.

COMPETITIVE CHRONOMETER AND WATCH TRIALS AT GENEVA.

THE celebration of the Centennial of Swiss Society of Arts has this year taken place under more than usual interesting circumstances: invitations were extended to watchmakers of all countries to compete, and the conditions imposed were more rigorous than in former years. The trials lasted fifty-two days, during which the competing chronometers were tested seven days in seven different positions; they were then submitted to a temperature of 30°, 35° heat, afterwards at one of 0°, 5° of cold, and the observations were classed as follows:—

1. Mean daily rate, not to exceed $\frac{1}{10}$ second per day; 2. Variation in seven positions not to equal two seconds during the seven days' trial; 3. Error in compensation, produced by differences in temperatures, not to exceed $\frac{1}{5}$ second per each degree of temperature; 4. The regularity of rate as maintained by the chronometers after having been exposed to the various tests.

The third test was the same as that imposed in 1875, the others being much harsher than those of the previous year.

In all, eighty-four chronometers were entered for competition; seventy-five manufactured in Geneva, seven Locle, and two in London. Two were withdrawn, and twenty-seven failed to comply with the requirements of the various tests. The performance of the remaining fifty-five was far above what was required. In some few cases, however, during the first few days, the rate was strikingly irregular, and suddenly they settled down and performed with wonderful accuracy, and the impression is that had these arrived a few days earlier their rates would have been much more satisfactory. In all, twenty-nine of the chronometers obtained prizes.

The premium of honour was awarded to Mr. Ulysse Nardin, of Locle. Mean variation $\frac{1}{100}$ second per day, mean variation in seven different positions, $\frac{1}{10}$ second, error of compensation, $\frac{1}{10}$ second, variations before and after tests to heat and cold, $\frac{3}{100}$ second.

Next came six chronometers whose performance was so similar that they each obtained equal premiums, viz., silver medals.

E. Kegren	...	...	0.34	1.26	0.05	0.18
Parkinson & Frodsham	...	...	0.47	1.35	0.02	0.04
J. M. Badallet & Co.	...	...	0.49	1.22	0.01	0.20
H. Radard & Fils	...	...	0.39	1.56	0.03	0.13
Perregann	...	...	0.50	0.44	0.02	0.86
Fleuhmann & Co.	...	...	0.68	0.67	0.03	0.08

The second premium, a silver medal, was awarded to a chronometer whose maker withheld his name, but regulated by Mr. George Raymond. The test was as follows:—0.31, 1.04, 0.15, 0.43.

Then came seven more, to which were voted "honourable mention,"—E. Kegren, 2; Parkinson & Frodsham, 1; J. M. Badallet & Co., 1; H. Radard & Fils, 1; rated by George Raymond, 1; Ulysse Nardin, 1. Together, fifteen chronometers having obtained prizes, fourteen more were so close to the test that they might almost have won premiums. All have performed much more satisfactorily than those competing in 1875, and it is a matter of sincere congratulation that such good results have been obtained this year. In the report of Professor Plantamour, Director of the Geneva Observatory, on the international competitive trial of pocket chronometers and watches, he says:—

"If the manufacturers of our town have liberally responded to the appeal addressed to them, the participation of the foreign manufacturers has been so small that the qualification 'international' can scarcely be applied to this competition. Indeed, out of a total number of 84 chronometers, there are only nine from four manufacturers not established in Geneva, whilst the remaining 75 have been deposited by 13 houses of our town. However, the number of chronometers that have undergone all the tests required by the programme is 82 only, two having been withdrawn at the outset, the irregularities of rates having shown the inutilty of continuing the observations. The trials have been carried out in conformity with the programme published the 1st of July, 1875, save in one point, otherwise unimportant, by which the number of the chronometers raised a material difficulty. The programme provided that all the chronometers should be tested simultaneously in the oven; then, after a day's interval, in the ice-box, the sixth and ninth period (the one of which precedes, and the other follows, the trial of the compensation) being for all of seven days' duration.

"The dimensions of the oven, and the ice-box, not allowing more than 36 chronometers to undergo the compensation test at the same time, it was necessary to spread the tests over three consecutive days, three separate series.

"For the chronometers of the first series, the sixth and ninth periods have been seven days each; for those of the second series, the sixth period has been eight days, the ninth period six; finally, for those of the third series, the sixth period has been nine days, and the ninth, five days only. This slight inequality in the relative duration of the two periods is of no importance. As the question is to determine the change effected in the average rate of a chronometer at the ordinary temperature, after having passed through variations of temperature such as those afforded by the difference between the stove and the ice-house, a period of five days is amply sufficient to show the average rate during that period; it was therefore a matter of indifference to prolong by a day or two the sixth period, and to shorten by as much the ninth period.

"The programme provided four different tests, by fixing for each of them very restricted limits of variation, which were not to be exceeded by the chronometers competing for a prize.

"These limits being far more restricted than those entitling a chronometer to a first-class certificate according to the regulations of the Observatory, the chronometers not possessing the qualifications imposed for obtaining a first-class certificate were *a fortiori* excluded by the conditions of the present competition. The chronometers which come under that category are twenty-seven in number, for which consequently no notes of rates have been drawn up; the detailed notes of rates of the fifty-five other chronometers are lodged at the 'office' for the inspection of the 'classe.' I have summed up in the appendix to this report the results of the variations ascertained in each of the four trials by those fifty-five chronometers, which are arranged according to a registered number.

"If we examine the average figures registered for each trial for the average of the fifty-five chronometers, the results of this competition may be looked upon as highly satisfactory; these figures are certainly within the limit fixed by the programme to qualify for competing for a prize, whence it may be concluded that the conditions required to deserve a prize have been fulfilled on the average by all the chronometers, notwithstanding the severity of those conditions. However, from this it does not follow that all chronometers are qualified to compete because it suffices, according to the programme, that the limit be exceeded in one of the four trials, to preclude a chronometer from all further chance of a prize. I have marked, by an asterisk, the trials for which the limit had been exceeded, which consequently brought about the exclusion of a chronometer, making due allowance for the inevitable uncertainty which results from the observations in the calculated amount of the variation. In the observations we are obliged to limit ourselves to the tenth part of a second, and in the majority of the chronometers, of which the seconds' dial is very small, and often badly divided, it is impossible, even with a magnifying-glass, to go beyond, from which it results that the rate in twenty-four hours is uncertain within the limits of a tenth of a second at least, from the simple fact that no account is taken of hundredths of a second, and even if the figure of the tenth given by the comparison were correct. In seeking to appreciate, according to the rules for the laws of probabilities, the influence which the hundredths of a second neglected in the comparisons may have on the amount obtained for the average variation of rates from one day to the other, we find that it may amount to two or three hundredths of a second; as, moreover, an error of a tenth of a second in the comparison may be committed from time to time, and as the correctness of the clock may also be affected by an uncertainty of this kind during several days of clouded weather, the uncertainty attaching to the amount of variation found by comparison might reach several hundredths of a second. It might consequently happen, in the cases where the limit fixed by the programme is exceeded by a very small quantity, that the unreliability of the comparisons may have been the cause of it, and not the irregularity of the rate of the chronometer; for this reason I have only affixed the asterisk, indicating exclusion, in those cases where the limit of the programme had been exceeded by a quantity greater than that which might have arisen by the inevitable uncertainty of the comparisons.

"The examination of the notes of rate of some of the chronometers point to a peculiarity which shows that in many cases irregularities of rate are accidents, which might, perhaps, be attributed to the manner in which the piece has been carried to the Observatory, and to the fact that it has not had the time of resuming its normal rate before the commencement of the comparisons. For these chronometers, it is during the first period only, viz., from the 15th to the 22nd of February, for some even during only the two first days, that irregularities of rate have been found out of all proportion with those which were discovered during the following periods, so that the average variation would be considerably reduced if the comparisons had commenced eight days later.

"The most remarkable example is given by the chronometer entered the No. 71, the rate of which, dating from the 22nd of February, is of a remarkable regularity; so that from that time until the 7th of April the average variation from one day to the other is $+0^{\circ}, 24$ only, whilst the irregularities of the first week cause the mean variation, from the 15th of February to the 7th of April, to amount to $+0^{\circ}, 68$. The total of the variations of that week alone is more than double that of the variations for the six following weeks.

"Out of the fifty-five chronometers there are twenty-six which, in accordance with the programme, must be excluded from the competition, as not having fulfilled all the conditions required in all the trials. Out of this number

16 have failed in one trial only;

7 " " two trials;

3 " " three trials.

"The trial which has given rise to the greatest number of exclusions (thirteen in all) is the fourth, viz., that of the comparison of the rate before and after the trial of the compensation, six chronometers having been excluded by that trial alone whilst fulfilling the conditions required by the others. For the three other trials the number of the exclusions is nearly the same—from eight to nine.

"It then remained only to make the classification in order of merit of the twenty-nine chronometers which had fulfilled all the conditions required to enable them to compete for a prize; and in that classification, whilst taking into account the result in each of the four trials, a double importance had to be attributed, as prescribed by the programme, to the results obtained in the two first trials. The simplest means, and at the same time the most exact, of making such a classification is that which I employed in previous competitions. The rank of a chronometer in each trial is determined by a certain number of points, increasing with the merit of the chronometer, starting from 0 as the limit corresponding to the exclusion, and proceeding to 100, as representing the absolute perfection for the two first trials, and to fifty for the two last.

"For each chronometer the points obtained in the four trials are summed up, and the rank of a chronometer is determined by the number of points obtained, absolute perfection corresponding to 300 points, the inferior limit of 0 representing the merit of a chronometer which has simply fulfilled all the conditions necessary to compete for a prize. The formulæ which serve to calculate the number of points in conformity with the stipulations of the programme are, if we designate by V, V^1, V^2, V^3 , the amount of the variation expressed in each of the four trials in hundredths of seconds:

$$(60-V) \times 1.66 \text{ for the first trial;}$$

$$(200-V^1) \times 0.5 \text{ for the second trial;}$$

$$(20-V^2) \times 2.5 \text{ for the third trial;}$$

$$(100-V^3) \times 0.5 \text{ for the fourth trial.}$$

"The annexed schedule gives, for the twenty-nine chronometers that had to be classed, the number of points calculated by these formulæ for each of the four trials, as well as their total amount; the sign — which precedes some of the figures, arising from the limit having been exceeded by a quantity so small as not to justify exclusion, the difference of the limit was negative, and the total of the points had to be diminished from the corresponding number.

"The last column of this schedule, which contains the totals of the points, shows that the first portion in order of merit belongs incontestably to the chronometer inscribed under the number fifty-two, which has obtained 218 points out of 300—that is to say, which is only short eighty-two points of absolute perfection. Afterwards some six chronometers, for which the totals of points differ so little that it would be unjust to attempt to attribute to them any inequality as regards merit, because the difference might bear upon quantities inferior to the uncertainty arising out of the comparisons; in fact, each hundredth of a second in the average variation corresponds to $1 \frac{2}{3}$ point, and as the hundredths neglected in the comparisons produce an uncertainty of two hundredths of a second at least in the average variation, an uncertainty of from two to three points results from this trial only.

"It therefore appears to me equitable to place these six chronometers exactly on an equal footing, which, naming them according to the registered number, are as follows:—

No. 16, which has united 141 points

No. 28, " " 147 "

No. 34, " " 145 "

No. 43, " " 144 "

No. 49, " " 147 "

No. 71, " " 143 "

"The average number of points for these six chronometers is 145, with a difference of two, more or less, from one to the other, which difference is not sufficient to cause an inequality.

"We find afterwards, No. 26 closely following the preceding ones with 138 points (or marks), then the seven following chronometers, according to the order of inscription, which have all obtained 100 marks and more:

No. 1, with 124.

No. 51, with 112.

No. 29, with 121.

No. 53, with 100.

No. 42, with 106.

No. 54, with 104.

No. 66, with 106.

"In appreciating the result of this competition, with regard to the rank of the chronometers given by the order of classification, and the prizes or distinctions which are to be awarded, we must necessarily take into account the considerable distance which separates the No. 52 from the six following ones, and consequently give it a special distinction, which might be done by awarding it a prize of honour. A rate as regular as that of this chronometer during the fifty-two days of the duration of the competition, and this in all circumstances of position and temperature, is sufficiently exceptional to deserve a special distinction.

"A first prize *ex æquo* ought to be awarded to each of the six chronometers which follow, and are classed in the same rank, viz.:

"The Nos. 16, 28, 34, 43, 49, and 71.

"Afterwards, a second prize ought to be given to No. 26, which follows closely the preceding ones in the order of classification; at last the seven chronometers, which have united 100 points and more, viz.—the Nos. 1, 29, 51, 42, 66, 54, and 53, would be entitled to an honourable mention.

"If we wish to render ourselves an account of the progress realized in the timing (*reglage*) of the chronometers, from the comparison of the results obtained in the present competition by the best chronometers, with those of last year's competition, we must not take in a direct manner for the term of comparison the number of the points or marks, notwithstanding the tests having been the same, because the point of departure is different. In this year's competition a much more elevated degree of perfection has been taken, as starting point, or 0, from which the marks are counted up to the maximum of 300, representing absolute perfection, which corresponds to a notable lowering of the number of marks corresponding to the same variations of rate.

"Thus, this year, the 0 for the average variation from one day to the other corresponds to an average variation of $0^{\circ}, 6$; last year to one of $0^{\circ}, 8$; the 0 for the average *strain*, or *digression* (*écart*), according to the position, is this year up to $2^{\circ}, 0$; last year it was of three seconds. For the difference of rate between the sixth and ninth period the 0 corresponds this year to a difference of one second; last year to two and a half seconds. For the compensation the 0 is the same in the two years, and corresponds to an error of compensation of $0^{\circ}, 2$, per degree. If we calculate the number of points (or marks) obtained this year by the best chronometers, taking for starting-point that of last year, we find for

"The No. 52, 245 points; last year, No. 7, 213 points.

"Average of the six following:—

"16, 28, 34, 43, 49, 71, 192 points; last year, Nos. 28 and 21 186 and 185 points.

"26, 181 points; last year, Nos. 1, 25, and 2, 174, 174, and 173 points.

"Thus the No. 52, the first of the present competition, is much in advance of No. 7, the first of last year's competition, and the six chronometers for which a first prize is proposed this year are in advance of Nos. 28 and 21 of last year.

"If for the six chronometers having obtained prizes last year we take the average figure of the variation in the four trials, we find:

$$+0^{\circ}, 45; +1^{\circ}, 01; +0^{\circ}, 065; +0^{\circ}, 48.$$

"This year the average of the eight chronometers for which prizes are proposed is—

$$+0^{\circ}, 43; +0^{\circ}, 99; +0^{\circ}, 040; +0^{\circ}, 32,$$

which figures are all inferior to those of last year.

"E. PLANTAMOUR, Professor,"

PRECIOUS STONES.

(Continued from page 4).

HISTORICAL DIAMONDS.

THE extraordinary value always attributed to large diamonds, combined with their scarcity, rendered it possible to follow for ages the history of some which belonged to high and celebrated personages, and never passed into the possession of different families or persons without great vicissitudes, of which, for the most part, mention is made in history. In relating that Berqueen was the first who cut the gem to sixty-four facets, by which the diamond took the name of brilliant in Italy, we remarked that he had in this fashion cut three large diamonds, given to him for that purpose by Charles the Bold, Duke of Burgundy.

The first of these has now the name of Sancy; it weighs car. 33 $\frac{3}{4}$; it is of the first water, and in the form of a water-drop. The brave but unfortunate duke wore this stone in his helmet the fatal day of Granson. It remained with him on the field of battle, and was there found by a Swiss soldier, who sold it to a priest for two Turin lire: the priest, without being aware of its value, resold it for three lire to some unknown person, whose traces were lost. In 1589, by means of the form, the weight, and quality of water, this diamond was known to be in possession of the Court of Portugal. King Antonio gave it in pledge to the treasurer of the King of France, Niccola Harley de Sancy, who at last bought it for one hundred thousand "tornesi." From the family of the treasurer, who possessed it a long time, and from whom it took its name, Henry III. of France borrowed it. He attempted to pledge it, and so raise money for the payment of his mercenaries; and for this purpose he intended sending it to Switzerland. He therefore consigned it to a trustworthy person, who, however, was not able to reach the end of his journey, for on the road he was attacked and killed by robbers, which came to be heard of some years after, although at the time nothing was known of it. It appears, however, that the king's messenger, wishing to save the gem confided to his care, swallowed it, to disappoint the robbers. We have not heard how the magistrates of the place became aware of the fact, but it is certain that the dead body was disinterred, and the brilliant, being found in its stomach, was restored to the house of Sancy. One of the barons of this family gave it to King James II. of the Stuarts, when in exile at St. Germain, and he sold it for 625,000 tornesi to Louis XIV. Thus the Sancy entered the French treasury. In the inventory made in 1791 it is valued at one million francs. When, in 1792, the royal treasury was robbed, it disappeared. In 1835 it was found again in the hands of a partisan of the Bourbons, who sold it to the Master of the Hunt of the Emperor Nicholas for 500,000 roubles. Now it belongs to the family Demidoff, of Petersburg.

The second diamond cut by Berqueen was given by Charles the Bold to Pope Sixtus IV. As described by Benvenuto Cellini, it always afterwards remained in the pontifical treasury, set in various forms at different times. It is used at the grand sacred functions by the pontiffs as an episcopal ring. It is a large thin stone, cut in long, regular facets; of fine water, but of little brightness on account of the single cutting. It weighs 14 $\frac{1}{4}$ carats, light weight, and may now be valued at fifty thousand lire.

The third, a misshapen stone, was cut by the clever workman into a triangular form, and the duke had it set in one of the rings then worn, formed by two hands clasped in friendship; he gave it as a token of loyalty and friendship to Louis XI. of France.

The finest, if not the largest, of known brilliants is that found in the natural adamantine deposits of Partea, forty-five leagues south of Golconda; in its rough state it had the extraordinary weight of 410 carats; but the labour requisite for polishing them, and which lasted two years, reduced the weight to 136 $\frac{1}{2}$ carats. From the cutting it acquired an almost square form, with double faceting, which imparted great brightness to it. When in a rough state it was bought by the grandfather of the celebrated Pitt, when governor of Fort St. George, at Madras, for 312,500 lire. The expense of cutting it amounted to 125,000 lire. The pieces remaining from the cleavage were valued at from 75,000 to 100,000 lire. The Duke of Orleans, Regent of France during the minority of Louis XV., bought it in 1717 for the sum of 3,375,000 lire, and from that time this brilliant has been called the Regent. In the inventory of the treasury of France, to which it still belongs, its value was estimated at 12,000,000 lire; but this price is evidently exaggerated.

The largest diamond known would certainly be that said to belong to the King of Portugal, and which is included in the imperial treasure of Brazil, if there was not a reasonable suspicion that it may be really but a white topaz. Guarded with jealous care, no

exact description of this gem has ever been obtained; and this secrecy gives more foundation for the opinion that it is not a true diamond. It is said to be of a yellowish colour, and in size nearly equal to that of a hen's egg; but in form similar to the chick-pea, and concave at one side. It was found in Brazil, at a place called Cay-de-Merin, near the river of Malho-verde. According to Ferri, it weighs 1730 carats, and according to Marve, 1680. It is valued at seven thousand million lire. The slave who discovered it was set at liberty, from which fact is corroborated the aphorism that "liberty is inestimable." Besides this, the Emperor of Brazil possesses two other diamonds of less dubious quality, but of much smaller size; the largest of these two weighs 215 carats. They possess rare beauty, and were found by three bandits near Abayte, a river that runs in the province of Minas-Gereas. Marve saw them and states that they are rough, and have a surface of 28 millimetres, and 9 in depth. Marve also affirms that he saw there two octohedral diamonds, weighing—one, 134 carats, and the other 120.

A brilliant of pyramidal form, valued at 827,000 lire, belongs also to the Brazilian treasury, and ornaments the handle of King Giovanni's staff. Here is still preserved the robe of state belonging to King Guiseppe I., which has twenty buttons, each of which is a single brilliant, and all together are worth 2,500,000 lire.

In the neighbourhood of Landak a diamond was found in the year 1787 which in its rough state weighed 318 carats. It belongs to the Rajah of Matau, in Borneo. In 1820 the Governor of Batavia sent Stewart to the rajah to offer him in exchange for this gem two armed ships of war, and the sum of 150,000 dollars; but the rajah refused to give it, on account of a superstition held by his Malay subjects, who considered this stone as inseparable from the destinies of their nation, and believed that the water in which it had been immersed could cure every kind of illness.

Under the name of Nizam a diamond is known which belonged to the King of Golconda, and weighs 340 carats; its value is as much as 5,000,000 lire.

The Grand Mogul diamond was dug out of the mines of Gani. As described by Tavernier, at first it was thought by some to be a white sapphire; but, as there did not appear sufficient reason to keep to this opinion, it is now spoken of as a true diamond. A famous Indian captain, named Mirghimola, made a present of it to the Grand Mogul Aurung-Zeb. It appears that Thamas Koulikan, so celebrated under the name of Nadir Schah, took possession of this gem, which therefore, in Persia, would now be called Deryai-noor, or *Ocean of light*. According to Caire, it weighed, when rough, 780 $\frac{1}{2}$ carats; worked, but 279 $\frac{3}{8}$. He affirms that it is in the form of half an egg; that it is cut in rose form, and that it is of a beautiful water, the colour tending to pink. This gem was cut in the eighteenth century, in India, by one Ortenzio Borghia, an Italian.

Marco Polo, Tavernier, Methold, Chardin, Jaubert, and many other travellers, relate wonderful things of diamonds seen by them in India, and of which we have no particulars. Amongst these the most remarkable would be that which Tavernier called the Aghrah, and which, according to him, weighed 645 $\frac{3}{8}$ carats. The Koh-i-noor, or *Mountain of light*, of which we have already made mention when speaking of diamond-cutting, belonged, it is said, to Carna, King of Anga; it is the most anciently known of all large diamonds. It weighed about 186 carats. The superstitious Hindoos believed that this diamond brought misfortune to whoever possessed it. It is said that in the seventeenth century it was given to the already-nominated Grand Mogul Aurung-Zeb, and from that hour his dynasty began to degenerate, every son being worse than his father, until 1739, when the last of these sovereigns, Mohamed Schah, in the sacking of Delhi, his capital, was deprived of the ill-omened jewel by Nadir Schah. The conqueror was assassinated by his generals on his return to Persia, and the diamond fell into the hands of one of the conspirators, Ahmed-Schah-Doorannee, founder of the Afghan monarchy, whose history is a perpetual succession of crimes. Runjeet-Singh, Schah of the Punjab, or Five Rivers, extorted it from the last of the Afghan kings of Caboul, Soujah-Schah; and, in order to deprive it of its fatal influence, he dedicated it to the Temple of Juggernaut. But his successor, not respecting the paternal will, took it from the temple, and the Punjab became subject to England. It is said that the English East India Company bought it for 6,000,000 lire. Lord Dalhousie presented it to Queen Victoria in 1849; and the superstitious Indian subjects of Great Britain, always retaining the same idea, attributed to the Koh-i-noor the revolt of Delhi and the death of Prince Albert. After being taken to London it was again cut, and consequently diminished in value; nevertheless it remained extraordinary on account of its length and width.

(To be continued.)

AN EXPLANATION OF THE PRINCIPAL TERMS MADE USE OF IN ASTRONOMY.

Earth, the globe we inhabit, is one of the seven planets, and the third in order from the sun. Eccentricity is the distance between the centre of an ellipsis and either of its *foci*.

Eclipse of the Sun is an obstruction of his light occasioned by the interposition of the moon between the sun and our sight.

An *Eclipse of the Moon* is when the earth comes between the sun and moon.

Elliptic is a great circle of the sphere in which the sun always appears to move, and is so called because eclipses generally happen when the moon is in or near this circle. The line is supposed to be drawn through the middle of the zodiac, making an angle with the equinoctial line of about $23^{\circ} 30'$, which is the sun's greatest declination; or, more strictly speaking, it is the path or way among the fixed stars that the earth appears to describe to an eye placed in the sun. Some call it the way of the sun, because the sun in his apparent annual motion never deviates from it as all the other planets do more or less.

Elevation of the Pole is an arc of the meridian contained between the pole and the horizon; which is always equal to the latitude of the place, or the distance of the zenith from the equator.

Elongation is the angular distance of a planet from the sun as it appears to a spectator upon the earth.

Ellipsis is a figure formed by cutting a cone obliquely to its axis. It is in a curve of this kind that the planets move round the sun, and the satellites round their primaries.

Emersion is the time when any planet which is eclipsed begins to recover its light again.

Epact is the moon's age at the end of the year, or the difference between the solar year and the lunar one.

Epoch is a fixed point or period of time from whence the succeeding years are numbered or counted.

Equation of Time is the difference between the equal time and apparent, or that shown by a perfectly true clock and sun-dial; by which is meant the reducing the apparent unequal times or motion of the heavenly bodies to equable or mean time.

Equator is that great circle which divides the northern from the southern hemisphere, and being referred to the heavens is called the Equinoctial. When the sun comes to the equator the days and nights are equal throughout the world.

Equinoxes are the two points where the ecliptic cuts the equator, so called because when the sun is in either of these situations the days and nights are equal throughout the whole globe. In other words the equinoxes are the precise time when the sun enters the equinoctial points Aries and Libra; the former, being the 21st of March, is called the *vernal equinox*, and the latter, on the 23rd of September, the *autumnal equinox*. Vernal signifies belonging to the spring.

Ether.—A fine subtle fluid, which is supposed to fill the whole celestial space between the heavenly bodies and our atmosphere.

Foci of an Ellipsis are two points in the longest or transverse axis, on each side of the centre, from each of which if any two right lines be drawn to meet each other in the periphery, their sum will be always equal to the transverse axis.

Galaxy, or Milky Way, is a large, irregular zone, or band of light, which encompasses the heavens. This stream of light is supposed by modern astronomers to be occasioned by a profusion of stars.

Gemini, the Twins, the third sign of the zodiac, contains ninety-four stars. This sign is marked on the globes by the hieroglyphic of two kids, because at this time the sheep generally bring forth their young in pairs. In the place of the Egyptian hieroglyphic the Greeks have substituted without any propriety the twin brothers *Castor and Pollux*.

Geocentric Place of a Planet is that position which it has when seen from the earth.

Georgium Sidus.—A new planet was discovered in 1781 by the late Dr. Herschel, who called it *Georgium Sidus* in compliment to the king; but most astronomers have considered himself as better entitled to the honour—though some have named this planet *Uranus*. Flampstead, Mayer, and Le Moinnier had long ago observed it as a little star; but in 1781 Dr. Herschel observed that it had shifted its place, and by continuing to observe it he found it to be a planet.

Gibbous is a term used in reference to the enlightened parts of the moon, whilst she is moving from the first quarter to the full, and from the full to the last quarter, on account of the dark parts appearing horned and the light ones convex.

Golden Numbers.—A series of numbers, proceeding from 1 to 19, used in the almanac for determining the times of new and full moons.

Gregorian Year is that which is so called from Pope Gregory XIII., who reformed the calendar in the year 1582, which reformation was not used in England till 1752.

Greyhounds.—A constellation in the northern hemisphere, which consists of twenty-four stars.

Grus, the Crane.—A constellation in the southern hemisphere, containing fourteen stars.

THE HOROLOGICAL INSTITUTE AT LOCK AND SAFE MAKING.

(Communicated.)

ON Wednesday, the 16th ult., a considerable gathering of members of the Institute, and a few friends, accompanied by Mr. Jackson and Mr. Glasgow, Vice-Presidents, and Mr. F. J. Britten, the Secretary, assembled (by previously obtained permission) at the extensive Lock and Safe Works of Messrs. Hobbs, Hart & Co. (of Cheapside), situated in Arlington-street, New North-road.

We were received by Mr. Sylvanus, the chief manager of the firm, and, on account of the number present, it became necessary to divide us into three parties: Mr. Sylvanus himself taking charge of one, Mr. Laming, the directing engineer, of another, and Mr. Calvert, of the third.

Our principal object in visiting these works arose from a desire, on account of the extent to which automatic machinery is used, to see the practical application of it in the manufacture of locks and keys. We therefore did not stint ourselves in the matter of special examination, nor of asking questions. The present writer cannot enter into a minute, technical description of the different operations, which it may be hoped will some day be done, but will just sketch what we all saw as we passed along; and first of locks. Upon entering the machine shop the first thing that we noticed was a formidable shearing and stamping machine, at which a workman sat, with a pile of blank lock plates before him. He simply fed the stamper, and punched every hole for the lock at the rate of ever so many an hour. After that there was the tapping machine for the screw-holes, and the shearing for straight edges. In the brass locks the blank plates are stamped out first of all from a long strip of brass, and then punched in the punching machine and screw-tapped; the levers are also stamped out. We saw lock springs made very rapidly by a young woman. Keys and lock-bolts are stamped, red hot, out of the solid iron, a steam-hammer die doing the latter, further operations being cleaning and grinding. It then goes upstairs to have the "centring" done, after which the pin-hole is drilled, and the steps are cut. This step-cutting machine is managed by a woman, and its automatic action is so curious that it would require a description to itself; we cannot even pretend to give an outline of it. It has two quadrants, with index-hands to regulate its motion, and when the blank key is fixed on it, it will only cut what the index is set for, and can never go wrong. All the steps are cut one after another with great precision. It is next cleaned, and the lock fitted to it, in a manner which we cannot here sufficiently explain, but it is very interesting, nevertheless; after being fitted it is case-hardened and polished. The various portions of the lock are collected from the different machines, taken into the fitting-room, and put together. We saw a great deal of machinery at work in screw-cutting, tool-making, &c., that we cannot enumerate, but were full of "wrinkles" to the clockmaker.

We next went to the Safe Works, and saw how safes were made fire-proof, burglar-proof, &c., but, however astonishing the different operations were to us, the technical description of them must be left to the pen of the literary engineer.

After leaving the works we went into the private office, and here a real surprise awaited us. This was no less than the union of horology and lock work. We were shown a chronometric lock having two compensated lever escapements whirling along in lively style. We asked, "What those escapements can have to do with locking?" It was, however, explained to us that the escapements governed the action of the lock, that it could be set to any given hour, and that, until that hour arrived, the keys of the lock were quite useless; in fact, they were plugged out until the time came, when a detent let them in. We understand that a full description of this singular lock is about to be published. After admiring it greatly, Mr. Jackson, in the name of the company, warmly thanked the firm, through Mr. Sylvanus, for the courtesy that had been shown to us all over the works, after which we took our departure. We trust that the firm, following the enterprise of the age, will see fit to publish a detailed account of the very unique machinery employed in lock and safe making.

BRITISH EXHIBITS AT THE CENTENNIAL EXHIBITION. WATCHES, JEWELLERY, AND SILVERWARE.

THE American Jeweller and Silversmith devotes considerable space to the description of the exhibits of watchmaking, jewellery and silverware at the Centennial Exhibition. And in alluding to exhibits of British manufacture describes them as follows:—

EXHIBITS OF MR. JOHN NEAL, OF EDGWARE ROAD, LONDON.

The jewellery exhibits in the main building are a constant source of attraction to all the visitors, and are deserving of more than a passing glance. England is well represented by several houses, prominent among which is that of Mr. John Neal, manufacturing jeweller, watchmaker, and silversmith to the Queen. Although the space allotted to him (C, 27, near the office of the English Commissioners) is on one side of the main building, some distance from the usual avenue of the crowd in the centre, we noticed hundreds of visitors stopping to admire the fine display. The exhibits comprise gold and silver jewellery, fine lever watches in gold cases, and silverware. A specialty is made of the production of a high grade of lever watches in gold and silver cases, including split seconds chronograph for timing horses. A large collection of sterling silver lockets are shown of unique design and of various patterns, oblong, turban, &c. Some superb bracelets in solid gold, set in diamonds, breast-pins, lockets, necklets, &c., are among the chief attractions of the case. Considerable space is given to the display of fine gold rings set with diamonds, emeralds, opals, rubies, carbuncles, &c. Fine ladies' and gents' 18 carat hall-marked gold chains, in a variety of beautiful patterns, are displayed in the collection of Mr. Neal, as also onyx lockets of great beauty. A novelty, which would certainly command a ready sale if kept by jewellers in the United States, is a patent gold pocket pencil, containing a slide calendar on the top end of the case which can be readily set for any month in the year. The exhibit of best electroplated ware on hard nickel silver, comprising fruit dishes, table sets, candelabras, &c., is worthy of special commendation. These goods were exhibited at London, Paris, and Vienna.

EXHIBITS OF MR. WILLIAM GIBSON, MANUFACTURING JEWELLER, BELFAST, IRELAND.

In passing through the British section in the main building, we were strongly attracted to the superb display of jewellery made by Mr. William Gibson, of Belfast. His exhibits of Irish jewellery cannot fail to favourably impress all persons visiting the Exposition who have even the most cursory knowledge of the value of articles in this line. The display is worthy of note, first, because of its great intrinsic value, rivalling all of the jewellery exhibits in this particular; second, for the originality of the designs shown; and third, on account of the locality in which the articles were made.

Belfast has always been famous for its manufactures of linen goods, but not until within a few years past has it enjoyed any prestige in the goldsmiths' art. If we may be allowed to form an opinion from Mr. Gibson's display, we will say that the jewellers of London and Birmingham must look to their laurels. His plate-glass show-cases are rich and elegant in appearance, black, striped with gold, 12 feet in width, and 14 feet in height, with a handsome canopy draped in blue silk. A copy of the Belfast arms and several Irish emblems surmount the whole. It is not of the cases, however, but of their rich contents to which we invite the attention of our readers. All the designs of the jewellery exhibited were made at Mr. Gibson's manufactory in Belfast, and the work executed under his own supervision. Nothing has been copied from Germany, France, Italy, or any other nationality; and in this particular he is entitled to the great credit of having the most valuable collection of jewellery to be seen in the Exhibition. The refining processes are most carefully conducted, and the selections of precious stones made to correspond with the designs. His daisy hair-pins are choice *morceaux*, the leaves being upon delicate springs that yield to the slightest motion, and thus arranged give the pearl and diamond ornaments not only the appearance of great richness but a life-like naturalness, as if one gazed on a living flower bearing upon its leaves the precious stones as a native production. It is in such things as this that true art prevails. Mechanism is a sombre pounding out of designs; skill enables the mechanic to amplify, and taste to beautify with such elaboration as correct judgment always suggests. Mr. Gibson's display evidences a very refined taste, while every article will bear the closest scrutiny. Among others, his bracelets, ear-rings, finger-rings, chaplets and tiaras are most exquisite productions, calculated to attract attention and to win for him a well-earned renown at the International Exhibition.

A masterpiece of art and beauty, and the finest collection of precious stones on exhibition in one set of jewellery, is that of a pendant set containing large emeralds in the centre surrounded by diamonds. Separately, they are a breast-pin and ear-rings, and the whole form a tiara, being connected together in *fleur-de-lis* with diamonds. The largest emerald is about 1½ inch in length by 1 inch in width, and the other two are somewhat smaller. The emeralds are the largest and finest we have ever seen in this country, and the diamonds are all faultless in colour and perfectly matched. At a low valuation the set is worth \$20,000, and the largest emerald if lost could not be replaced for three times that amount.

Besides his richer jewellery, Mr. Gibson makes a fine display of Irish bog-oak jewellery, something of which we have seen very little in this country. The appearance is like jet, and there are, among others, many characteristic designs that can only be appreciated by those well acquainted with the Irish peculiarities. One small piece represents a man "wid a shillaly" who has just knocked down one man and is ready for another, while he says: "The man who speaks ill of his country deserves a fall!" Then the eye lights, just at the right moment, upon the "Harp of Old Ireland," elegantly carved from the same bog oak. Then figures of birds, pipes, candelabras, snuff-boxes, &c. Another piece is that of Paddy driving his pig to Donnybrook fair; and next we have the Irishman leaning upon his barrel of whisky, with the ready shillaly in one hand and a glass of mountain dew in the other. More characteristic and skilfully-arranged pictures—for such they really are, though all carved from the bog-oak—we do not remember to have seen.

Mr. Gibson is the manufacturer of a fine grade of stem-winding watches, which are much esteemed as accurate time-keepers. He has on exhibit a representation of the House of Parliament with the great clock over the main entrance. The latter is made of open brass work, so that all the movements are readily understood. The clock strikes the hours and chimes the quarters.

EXHIBITS OF CHARLES JEFFREYS, 103, HATTON GARDEN, LONDON.

The fitting up of jewellery establishments with the necessary articles for making a proper display of the goods kept in stock is a business requiring educated taste, originality, and the most skilful workmanship. Mr. C. Jeffreys makes a very elegant display of his goods in the main building, and as all the designs are rich and tasteful, he finds many who are attracted thereto, and are not unwilling to express their hearty admiration of the originality and taste shown in the production of the articles exhibited. Mr. Jeffreys employs his own designers, and we are assured that they are kept constantly busy, new goods being brought out almost daily. Some sixty of the very elegant and substantial plate-glass show-cases that have been brought from England, and that contain the manufactures of as many different firms in London, were made at the manufactory of Charles Jeffreys. This alone gives such character and publicity to his establishment as cannot fail to increase an already-extended reputation of twenty years' business. And when it is further known that his special case of manufactures in the main building is composed entirely of new designs, projected and completed within the past three months, some idea of his extended facilities may be reached by all interested in this class of manufactures. Upon a careful examination of the goods in question, we were struck with their simplicity, as well as their artistic finish. The jewellery cases, while rich in design, are constructed of coloured material, calculated to exhibit the contents to the best advantage, by exposing precious stones in contrast with appropriate tints. One of these cases represents a star in blue and gold—blue centre, white and blue points alternate. Another embraces the harp and heart. Still another and very elaborate ring case is a scroll of blue and white—the body white and borders blue. The delicate contrast of these prime colours add greatly to the beauty of the design. The white body is perforated for rings, and the jeweller himself must manage these by the colours and settings of the precious stones. Fortunately, these are so rich and variegated that good taste will soon point out the proper place in the tablet for each ring. There are also exhibited several neat patterns of boxes covered with the finest qualities of leather, and intended for bracelets and ornaments of similar character.

Mr. Jeffreys's jewellery cases for ladies and gentlemen are manufactured with the same remarkable taste, and so arranged that each particular article has its appropriate place.

His reflecting lamps for show-windows are of very attractive design. They are so constructed as to give a full and brilliant view of every article in the show-window, and at the same time not to blur and dazzle the eye of those who are gazing at the display within.

WATCHMAKING AT THE CENTENNIAL.

AMONG the many attractive features of the American Centennial may be found the entire process of manufacturing watches.

The machinery used for this purpose is exhibited by the WALTHAM WATCH COMPANY, OF WALTHAM, MASS., and the *Scientific American* (from which we extract the following interesting description, written by Mr. Joshua Rose) says that the department containing the Watchmaking Machinery is so continuously thronged, that one has to wait his turn to inspect the different machines. The principal processes exhibited are the manufacture of the screws, wheels, pinions, jewels, and damascening the plates.

The screws are made as follows:—

The wire used is polished wire, cut in lengths of about 12 inches, the diameter being that required for the size of the screw-head. A length of wire is passed through a hollow spindle, answering to the spindle of a lathe-head, and is held by a chuck, whose jaws are tightened by a spring movement. Upon placing a length of wire in the chuck, which is done by hand, the first operation is to cut off the end of the wire so that the first screw will be of the proper length. The next operation performed by the machine is to turn down the plain stem ready to be screwed, and this is performed by a simple square-nosed turning tool, which, by a cam movement, advances into the work, cutting the whole length of the plain part of the screw, and advancing toward the centre of the wire until it is turned down to the proper diameter, whereupon the tool recedes, and a spindle, answering to the tail-stock spindle of a lathe, but provided with a pair of dies in the place usually occupied by the dead centre, advances automatically, and as it meets the screw end it revolves, while the wire is held stationary, thus cutting the thread upon the screw to the requisite distance, and then the dies rotate backward and recede, leaving the screw free; the chuck then again grips the wire, and revolves it, while a cutting-off tool advances and cuts the wire at the distance necessary to leave the requisite thickness of screw-head, very nearly through. The cutting tool then recedes, leaving the revolving screw very nearly severed from the wire, and a cam arm, with a suitable attachment upon its end, swings over, and, taking hold of the screw, breaks it from the wire, severing the small section of metal left by the cutting-off tool, which section has but little more strength (on account of its small diameter) than is necessary to support the weight of the screw. The arm carries the screw to a revolving cutter, or milling tool, which cuts the slot in the head; this being done, the cutter lifts, by an automatic movement, out of the way, and a pin, moving horizontally, forces the screw out from the holding device in the cam arm, whence it falls into a trough provided to receive it. The position of this trough is such that the cuttings, as well as the oil and screws, fall into it, but, being perforated, the oil drains off and leaves the screws bare. During each of these operations, the oil is fed by pumps, and the whole of the movements are performed by the machine itself, so that the operator, having nothing to do but keep the machines supplied with wire, can attend to ten of them, each making 5000 per day. The smallness of these screws may be appreciated when it is stated that one of them weighs about the nine-thousandth part of an ounce.

The screws are then hardened, and the next operation is to round the end face of the head, preparatory to polishing it. This is accomplished by revolving a piece of Arkansas oilstone at a speed of about 1100 revolutions per minute. The stone is in the form of a tube, about $2\frac{1}{4}$ inches diameter and $\frac{1}{4}$ thick, and is carried on the end of a revolving spindle, similar to that of a lathe-head, and held by a similar head and bearings. The screw is picked up with a small pair of pliers, and put into a small clamp provided in a rest (similar to a slide-rest), and is then brought into contact with the outside corner or edge of the revolving oil-stone, which is freely supplied with oil, while the screw is revolved and moved laterally, so that the stone cuts the head rounding and true. It is astonishing to observe the precision with which the operatives, who are, with two exceptions, girls, will pick up these miniature screws and place them into the diminutive hole in the chuck, an operation more delicate than threading an ordinary needle, and yet it is performed with comparative ease, and apparently without requiring much attention or effort; and we are informed by Mr. Thomas, who superintends the operations at the Centennial, and to whom we are indebted for the excellent facilities afforded to us for our investigation of the operations, that the latter are too delicate to be so successfully performed by male labour. The next process is polishing the heads so that the tempering of the screws will leave the heads a bright, clear blue. This is performed with a wooden lap of the same shape and revolved in the same manner as the oil-stone described above, but running 800 revolutions per minute. The

polishing material used is Vienna lime and oil, the screw being brought into contact, in this case, with the end of the lap, the screw being operated as before. The Vienna lime is applied to the lap on the blade of a knife. The chuck, holding the screws, is in both these two last operations operated by a crank movement. When the polishing is completed, the screws are cleaned by the application of a piece of stein pith, such as is found in some kinds of wood.

CUTTING THE GEARS OR THIRD WHEELS.

The pinions called third wheels are sent to the Exhibition in the form of blanks, and are cut as follows:—The machine is provided, after the form of an ordinary gear-cutter, with two mandrils, one being in the machine, while the other is being supplied with blanks. These mandrils are hollow, and have several splits running along the part on which the pinions are held, thus forming what may be termed a spring mandril. Twenty-five blanks are placed close together on the mandril, and are tightened by a thumb-screw. The mandril is then put into the socket of the machine. The cutter used is similar to a turning tool, but is V-shaped on the back to insure its standing in the proper position—that is to say, with its face at a right angle to the faces of the blanks upon the mandril. It is fastened in a revolving head or mandril, which makes about 8000 revolutions per minute, and which is adjustable in height to accommodate different diameters of wheels, the mandril holding the blanks being stationary in height under all conditions. This mandril feeds along under the cutter in such a direction that the pressure due to the cut tends to force the work back from the cutter, which prevents the cutter from breaking, as it otherwise would do. When the cutter has cut one groove through the whole twenty-five blanks, the mandril holding them recedes automatically, and rotates the distance necessary to leave the sufficient width of tooth, when the mandril again advances beneath the cutter, the whole operation being continued until all the teeth are cut, when the machine stops itself.

MAKING THE PINIONS.

The blanks of which the pinions are made are short pieces of wire, and the first operation performed upon them is to chuck them in a universal chuck fastened to the spindle of the lathe; the face of this chuck is bevelled off, so as not to obstruct the vision of the operator. The blank is turned down first at one end and then at the other end, to nearly the required size, a tool and hand slide rest being employed for the purpose—the rest coming against a stop to regulate the diameter to which the tool will turn; a cutter fixed to the tail stock spindle faces off the ends and covers them, after cutting them off to the proper length. Another operator and machine finishes the turning; the process just described being the roughing out or blanking. In this second operation, the attendant has merely to put them in and take them out of the lathe, which takes but an instant; the lathe tools, operating automatically, cuts the parts the proper diameters and lengths, leaving the work clean, bright, and true.

CUTTING THE PINION TEETH.

The pinions are now ready to have the teeth cut in them, which is done as follows:—The delicacy of this operation renders it impracticable to cut out the teeth at one cut, or with one cutter, because that would entail that the pinions be held more firmly than it is practical without bending or, at least, springing them. The machine is therefore provided with a revolving head containing three spindles, each provided with a milling cutter. The first is a thin one, cutting a groove much thinner than the finished size, and lifted from contact with the pinion during the back stroke, which greatly preserves the cutting teeth. The second cutter is a little thicker, and operates the same as the first; while the third cutter merely takes a light finishing and very true and clean cut. Oil is freely supplied to all three of the cutters. One machine will cut two-hundred pinions a day, and one operator attends to two machines.

GLOSSING THE PINIONS.

The next process is to gloss or polish the teeth of the pinions—the glossing material used for this purpose being a fine oxide of iron. The pinions are picked up by pliers—in this as in all the former operations—being too small to be handled by the fingers, and are placed so that the stem on each side of the teeth lie in V bearings, open at the top. While in this position a lead lap, operating reciprocally and making about 400 strokes per minute, and supplied with the glossing material, traverses along the grooves of the teeth, imparting to them a high polish. Every second or so, the carriage holding the pinions drops a short distance, and a small steel arm moves the pinion, so that when the carriage lifts again, the lead lap will operate in the next tooth-groove. This process is

continued until the teeth are glossed to a superior polish, when the pinions are taken out, and cleaned by brush-wheels revolving at a high speed. The staff-polishing is performed by placing the pinions in a small head corresponding to a lathe spindle revolving about 3500 times a minute. At the back of this spindle stand two emery wheels of the same tubular form as the oil-stone described as used in the process of screw-head rounding. These two emery-wheels revolve with the plane of one at a right angle to that of the other. The polishing-wheel is upon a separate arm, and is circular and conical, with a flat place on the largest diameter of the cone.

In operation, this polishing wheel, while revolving at about 4000 revolutions per minute, is first brought into contact with the revolving emery-wheels, which grind sufficient off the end-face and diameter of the polishing-wheel to bring up the corner quite square, and thus enable it to polish the pinion staff close up to the teeth of the pinion. It then swings over to the pinion staff while the latter is being revolved at a high speed, and traverses along it while supplied with rouge.

After the polishing-wheel has done its duty, it passes over to the emery-wheels to get the corner made sharp again, it having become slightly rounded during contact with the corner of the staff, formed by its junction with the pinion teeth.

The finishing of the staff is performed by Vienna lime mixed with alcohol, and applied to a small piece or slip of wood, which is operated, as a file would be, against the staff, imparting to the work a very fine and superior polish.

The next process is that of cutting a pivot on the end of the staff, and rounding off the edges with a very fine small file; the conical point of the staff is finished by a steel lap in the shape of a cross, and having the edges of the laps bevelled off to the necessary taper. As the lap moves reciprocally, the conc side of one of the edges rests upon the end of the staff, while another edge of the lap rests upon a jewel mandril, standing in the position of a dead centre in a common lathe; thus the lap is kept in the exact proper position to ensure that the work shall be all lapped exactly alike. The lap is supplied with Vienna lime, and alcohol, the finishing touches being imparted with the same materials applied upon a wooden slip.

The pinions are now ready to be cupped—that is to say, to have a small cupped recess turned in one side beneath the diameter of the teeth on the side face, to serve to hold the oil, which operation is termed “turning under.” The lathe is kept running continuously, the pinion being revolved by friction produced by the back lathe centre being held up by a spiral spring to put a pinion in the lathe; the back centre, which is in this case a cup made to fit the staff end, is pulled back against the force of the spring, and the pinion being placed into position, the spring is let go, and pressing the pinion against the running cup-chuck, the two revolve together. The operator performs the turning under, with a graver, by hand, using an eye-glass during the operation.

HUBBING THE THIRD WHEELS.

The third wheels, being made from sheet brass, have to be provided with a hub on one side, which is done as follows:—The wheels are first bored quite true with the teeth and of standard size. The blank hubs are made from brass wire, and have a small pin turned on one side, the other side being cupped or recessed to facilitate the riveting. The press on which the hubbing is performed has a small hole drilled in the horizontal face, which hole stands exactly central beneath a vertical plunger or spindle, which operates in an upright guide. The hub is placed beneath the plunger, and with the pin placed in the small hole, which thus keeps the hub true, the wheel is then placed on the hub, against the cupped side of which the end of the plunger is allowed to rest. A few light blows delivered by a hand-hammer upon the top end of the plunger, causes it to rivet the hub into the wheel. The wheel is next chucked in a lathe, and the end of the hub is faced off, and is next drilled, and the diameter of the hub is then turned tapering or conical, the burr left on the end of the cone by the turning process being removed by the facing-off tool first used. On the other side, the wheel is slightly countersunk. The wheels and pinions being turned quite true, and all the polishing done, the two are put together by a press, the pinion being forced into the wheel in what is termed a staking-press.

THE JEWEL WORK.

The jewels come to the Exhibition cut out in small disks, and with a small recessed conical centre in them, and the first operation is to chuck them. The lathe-head is provided with a small mandril, having its end, as well as its diameter, very true. A small spirit-lamp is held beneath the end of the revolving mandril, to which a little cement is applied. By holding against it a small stick of the same, the jewel disk is then applied to the end of the revolving

mandril, to which it will adhere, care being taken to leave the face containing the small recess outside. Then into this small recess is placed the point of a piece of steel wire, and the operator, by this means, moves the jewel upon the chuck until it runs true—an operation apparently difficult, but which the attendant performs in an instant. The jewel is then turned by a diamond tool supplied with water, and held in a small rest moved by hand; but the direction of the movement is guided by the rest, which thus ensures that the jewels shall be all of one size and shape. The cupping, necessary to one side of the jewel to retain the oil, is performed by a diamond tool in the tail spindle of the lathe.

The jewels are then ground by the application of copper tubes supplied with diamond dust mixed with sweet-oil. Two copper grinders are used upon the outside, and one upon the cupped surface of the jewel. Then a similar polishing copper tube is used upon the outside with much finer diamond powder and oil, and one is used with the same material for the cupped surface, the jewels revolving during the operation at a speed of about 5000 revolutions per minute. The last operation is to drill the jewels, which is performed with a fine diamond drill, inserted half way from each side of the jewel to prevent the latter from chipping during the operation. The quality of the whole of the workmanship is very superior, and the display is one of those the most admired of any of the entries in the Exhibition.

CHINESE DIVISIONS OF TIME.

THE Chinese divide the day into twelve shih-chen, or periods of two hours each, which are called by the characters of the Ti-chih, or terrestrial branches, (these characters are often spoken of as the horary characters). Thus 11 p.m. to 1 a.m. is tsze; 1 a.m. to 3 a.m. is chou, and so on. They further subdivide these two-hour periods by means of the characters chiao, or choo, and cheng. Thus 11 p.m. is called chiao tsze or tsze choo, (opening tsze), and midnight is tsze cheng. The time from 7 p.m. to 5 a.m. is divided into five watches (keng, in some parts called ching) of two hours each, and if a Chinaman is talking of anything that has happened between these hours, he almost invariably speaks of it as having happened in such and such a watch. These watches are announced by the beating of a gong or drum, but very commonly only a hollow bamboo and stick are used. The last-named is an instrument by which in every Chinese town the night is rendered hideous, and sleep next to impossible, on account of the din made by the numerous perambulating watchmen in order to show thieves that they are on the alert. The Chinese have no “weeks,” but they divide their moon into three decades (hsun), which are distinguished into shang, shung, hsia (*i. e.*, upper, middle, and lower); they also prefix the character choo (*i. e.*, opening) to each of the first ten days of the moon. The characters representing the twenty-eight constellations are given as names to each day of the year in regular order, but they are not in common use in the same way as our names for the days of the week. The Chinese appreciate foreign watches very much, and are especially fond of looking at their works; but, though they are in some parts very skilful in imitating many European appliances, we do not think that they have yet succeeded in manufacturing watches for themselves—at any rate, not to any extent. The native methods of telling the time are the clepsydra, incense-stick, and sun-dial.

SILVERING METAL GOODS.

DR. KAYSER, of Nuremberg, describes a process for giving a durable silver-like lustre to all descriptions of metal goods. Five parts pure tin, Australian by preference, as being almost absolutely pure, are melted with one part copper, and the molten mass granulated in the usual way. The granulation should be rather coarse than fine. The granulated metal is prepared with water and cream of tartar, as free as possible from lime. To 100 grammes of metal about 0.5 gramme of ignited nickel oxide is added, and the object to be treated is laid in the bath. After boiling for a short time the object is covered with a film having the exact appearance of silver, with the advantage of possessing a greater resistance to wear than tin or silver itself. The nickel oxide must of course be renewed from time to time. Copper or brass goods can be silvered without preparation; iron goods need coppering. If to the above bath carbonate of nickel be added, a film is obtained which is richer in nickel and darker in colour. The colour can be deepened from the hue of platinum to a blue-black, according to the amount of the nickel salt.

FINGER RINGS

(Continued from page 55).

IN the Duke of Newcastle's comedy, "The Country Captain," 1649, a lady of title is told that when she resides in the country a great show of finger rings will not be necessary. "Show your white hand but with one diamond when you carve, and be not ashamed to wear your own wedding ring with the old poesy."

That many rings were worn by persons of both sexes is clear from another passage in the same play, where a fop is described, "Who makes his fingers like jewellers' cards to set rings upon."

The stock of rings described in the same author's play, "The Varietie," as the treasure of an old country lady, is amusingly indicative of past legacies or memorials, as well as of the tastes of the yeomanry: "A toadstone, two turkies (turquoise), six thumb rings, three alderman's seals, five gemels, and foure death's head." The enumeration concludes with the uncomplimentary observation, "These are ale-house ornaments."

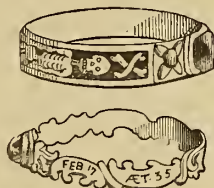
These death's-head rings were very commonly worn by the middle-classes in the latter part of the sixteenth and the early part of the seventeenth centuries, particularly by such as affected a respectable gravity.

Luther used to wear a gold ring with a small death's head, in enamel, and these words—MORI SÆPE COGITA, "Think oft on death;" round the setting was engraved,—O MORS, ERO MORS TUA, "Death, I will be thy death." This ring is preserved at Dresden. Shakspeare, in his "Love's Labour Lost," Act V., Scene 2, makes his jesting courtier, Biron, compare the countenance of *Holophernes* to "a death's face in a ring." We have already adverted to a similar ring worn by one of Shakspeare's fellow townsmen.

In the "*Recueil des Ouvrages à Orfèverie*," by Gilles l'Egare, published in the early part of the reign of Louis XIV., is an



FIG. 104.



FIGS. 105 and 106.

unusually good design for one of these rings, which we copy, Fig. 104. It is entirely composed of mortuary emblems, on a ground of black enamel. Fig. 105 is an English memorial ring set with stones; on the circlet is engraved an elongated skeleton, with cross-bones above the skull and a spade and pick-axe at the feet; the ground is black enamel. It has been converted into a memorial by its original purchaser, who caused to be engraved within the hoop, C. R., JAN. 30, 1649, MARTYR. It is now in the Londesborough collection, from whence we obtain Fig. 106, a very good specimen of a mourning ring of the early part of the last century, with which we take leave of this branch of the subject.

The jewellers of the last century do not seem to have bestowed the same attention on design as their predecessors did. Rings appear to have reached their highest excellence in design and execution in the *ateliers* of Venice. We meet with little originality of conception, and certainly great inferiority of execution, in the works then issued. In Southern Europe, where jewellery is deemed almost a necessary of life, and the poorest will wear it in profusion, though only made of copper, greater scope was given to invention. Fig. 107 is a Spanish silver ring of the early part of the century.



FIG. 107.



FIG. 108.

In its centre it has a heart, winged and crowned; the heart is transfixed by an arrow, but surrounded by flowers. It is possibly a religious emblem. Fig. 108, another Spanish ring of more modern manufacture, but of very light and elegant design. The flowers are formed of rubies and diamonds, and the effect is

extremely pleasing. Such works may have originated the "giardinetti" rings, of which a good collection of specimens may be seen in the South Kensington Museum, two being here copied in Figs. 109 and 110. They are there described as English works of the seventeenth and eighteenth centuries, and appear to have been used as guards, or keepers, to the wedding ring. They are of pleasing



FIG. 109.



FIG. 110.

floriated design, and of very delicate execution. Much taste may be exhibited in the selection of coloured stones for the flowers of such rings, which are certainly a great ornament to the hand.

Recurring to the Eastern nations, in whose eyes jewellery has always found great favour, we find that the Indians prefer rings with large floriated faces spreading over three fingers, like a shield. When made for the wealthy in massive gold, the flowers' leaves are of cut jewels, but the humbler classes, who equally love display, are content with them in cast silver. Such a ring is engraved (Fig. 111) from an original in the British Museum, from whence we obtain the two specimens of rings beside it, being such as worn by the humblest classes. Fig. 112 is of brass, Fig. 113 of

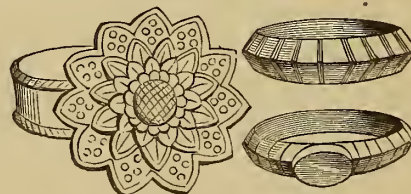


FIG. 111.

FIGS. 112 and 113.

silver, the latter boasting a sort of apology for a jewelled centre. A triplicate of Moorish rings will enable us to understand their peculiarities. Fig. 114 has a large circular face composed of a cluster of small bosses, set with five circular turquoise and four rubies, the centre being a turquoise, with a ruby and turquoise alternating round it. The ring is of silver. It is in the Londesborough collection, as also is Fig. 115, another silver ring set with an octangular blood-stone, with a circular turquoise on each side. Fig. 116 is a signet

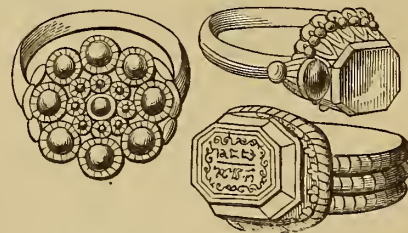


FIG. 114.

FIGS. 115 and 116.

ring, bearing the name of the original owner engraved on a carnelian. This also is of silver. The modern Egyptians indulge greatly in finger rings. The wife of the poorest peasant will cover her hands with them, though they only be cast in pewter, decorated with gems of coloured glass, and not worth a penny each. For ladies of the higher class very pretty rings are designed. One of them is here engraved (Fig. 117) from an original, purchased by the author in



FIG. 117.



FIG. 118.

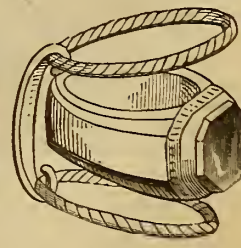


FIG. 119.

Cairo. It is a simple hoop of twisted gold, consisting of small beads of coral and thin plates of gold cut to represent the leaves of a plant.

As the hand moves these ornaments play about the finger, and a very brilliant effect might be produced if diamonds were used in the pendants. Fig. 118 is the ring commonly worn by the middle-class Egyptian men. They are usually of silver set with mineral stones, and are valued as the manufacture of the silversmiths of Mecca, that sacred city being supposed to exert a holy influence on all the works it originates. There is also a curious ring with a double "keeper" worn by Egyptian men, as shown in Fig. 119. It is composed entirely of common cast silver set with mineral stone. The lowermost keeper of twisted wire is put on the finger, then follows the ring, the second keeper is then brought down upon it, the two being held by a brace, which passes at the back of the ring and gives security to the whole.

At the commencement of the present century "harlequin rings" were fashionable in England. They were so called because set round with variously coloured stones, in some way resembling the motley costume of Harlequin. To these succeeded "regard rings," the stones selected so that the initial of the name of each spelt, altogether, the word *regard*, thus:—

R—Ruby
E—Emerald.
G—Garnet.
A—Amethyst.
R—Ruby.
D—Diamond.

These pleasing and agreeable *gages d'amitie* originated with the French jewellers, and were soon made to spell proper names.

When precious stones could not be obtained with the necessary initial, mineral stones, such as *lapis lazuli* and *verde antique*, were pressed into the service. These rings are now occasionally made. Her Royal Highness the Princess of Wales is said to possess one having the familiar name of the Prince, "BERTIE," spelt thus upon it.

With two specimens of modern French work we close our selection of designs. Fig. 120 is a signet ring, the face engraved with a



FIG. 120.



FIG. 121.

coat-of-arms. At the sides two cupidons repose amid scrollwork, partaking of the taste of the Renaissance. The same peculiarity influences the designs of Fig. 121. Here a central arch of five stones in separate settings is held by the heads and outstretched wings of Chimeras, whose breasts are also jewelled. Both are excellent designs. The last ring we shall bring before the reader's notice (Fig. 122) is the famous "fisherman's ring" of the Pope. It is a signet ring of steel, used for the briefs issued from the Romish Court. When a brief is written to any distinguished personage or has relation to religious or general important matter, the impression from the fisherman's ring is said to be made upon a gold surface,



FIG. 122.

in some cases it appears upon lead, and these seals are generally attached by strings of silk. Impressions of this seal are also made in ink direct upon the substance on which the brief is written. Mr. Edwards calls attention to the classic form of the boat and oar, showing direct derivation from an antique original. The seal is also made in the fashion of a Roman signet. A new one is made for every pope, and Mr. Edwards thus narrates the ceremonies connected therewith:—When a pope dies the Cardinal Chamberlain, or chancellor, accompanied by a large number of the high dignitaries of the papal court, comes into the room where the body lies, and the principal or great notary makes an attestation of the circumstances

Then the Cardinal Chamberlain calls out the name of the deceased pope three times, striking the body each time with a gold hammer, and, as no response comes, the chief notary makes another attestation. After this the Cardinal Chancellor demands the fisherman's ring, and certain ceremonies are performed over it; and then he strikes the ring with a golden hammer, and an officer destroys the figure of Peter by the use of a file. From this moment all the authority and acts of the late pope pass to the college or conclave of cardinals. When a new pope is consecrated, it is always the Cardinal Chancellor, or chamberlain, who presents the renewed fisherman's ring, and this presentation is accompanied by imposing ceremonies.

(To be continued.)

ON WATCH-CLEANING.—The greatest care is necessary in taking the watch down and separating its parts. First, remove the hands carefully, so as not to bend the slight pivots on which they work; next, remove the movement from the case, and take off the dial and dial-wheels; next, let down the mainspring, by placing your bench key upon the arbor, or winding post, and turning as though you were going to wind the watch, until the click rests lightly upon the ratchet, then, with your screw-driver, press the point of the click away from the teeth, and ease down the springs; next, draw the screws or pins, and remove the bridges of the train on the upper plate, as the case may be; next, remove the balance with the greatest care to avoid injuring the hair-spring. The stud, or small post into which the hair-spring is fastened, may be removed from the bridge or plate of most modern watches without unkeying the spring by slipping a thin instrument, like the edge of a blade knife, under the corner of it and prizing upward; this will save much trouble, as you will not have the hair-spring to adjust when you reset the balance. If the watch upon which you propose to work has an upper plate, as an American or an English lever, for instance, loosen the lever before you have entirely separated the plates, otherwise it will hang, and probably be broken. The watch being now taken apart, brush the dust away from its different parts and subject them to a careful examination with your eye-glass; assure yourself that the teeth of the wheels and leaves of the pinions are all perfect and smooth; that the pivots are all straight, round, and highly polished; that the holes through which they are to work are not too large and have not become oval in shape, and every jewel is smooth and perfectly sound, and that none of them are loose in their settings; see also that the escapement is not too deep or too shallow; that the lever or cylinder is perfect; that all the wheels have sufficient play to avoid friction, but not enough to derange their coming together properly, and none of them work against the pillar plate, and the balance turns horizontally and does not rub; that the hair-spring is not bent or wrongly set, so that the coils rub on each other, on the plate, or on the balance,—in short, that everything about the whole movement is just as reason would teach you it should be. If you find it otherwise, proceed to repair in accordance with a carefully-weighted judgment and the process given in this chapter, after which clean; if not, the watch only needs to be cleaned, and therefore you may go on with your work at once. **To Clean.**—The best process is to simply blow your breath upon the plate or bridge to be cleaned, and then use your brush with a little prepared chalk. The wheels and bridges should be held between the thumb and finger in a piece of soft paper while undergoing the process, otherwise the oil from the skin will prevent their becoming clean. The pinions may be cleaned by sinking them several times into a piece of pith, and the holes by turning a nicely-shaped piece of pivot wood into them, first dry, and afterwards oiled a very little with watch oil. When the holes pass through jewels, you must work gently to avoid breaking them.

BRITISH HOROLOGICAL INSTITUTE.—The usual monthly meeting of Council, was held 1st August, Mr. Glasgow, V.P., in the chair. It was resolved that an application be made to the Turners' Company to devote their prizes in 1877 for specimens of turning connected with horology; and that in the event of the Turners' Company adopting the suggestion, the Council offer their assistance in making the necessary arrangements. The Vice-Presidents of the Institute were requested to wait upon the agent of the Marquis of Northampton with a view to fixing the site for the new building. It was resolved that, at the conclusion of the next session of the drawing class an examination of the students be held, and that the silver medal of the Institute and other prizes be awarded. Mr. Bickley, Mr. Willis, and Mr. Isaac expressed their willingness to assist in a course of practical lectures to apprentices on the different branches of the watch trade during the winter.—*Horological Journal*.

THE
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MIRROR OF THE MONTH.

SEPTEMBER.

THIS month is so named from having been formerly the seventh month of the year, when, according to the ancient calendar, March was the *first* or beginning of the year. It derives its name from the Latin word, *septem*, seven. On the same principle were named, October, from *octo*, eight; November, from *novem*, nine; and December, from *decem*, ten. In our calendar, it is the ninth month.

The Saxons called September, Gerst-Monat, because in this month they generally gathered in *gerst* or *barley*.

The drink which they made from *gerst* was called *beere*, and on this account they often termed *gerst beer-legh*. It was soon corrupted into *ber-legh*, and subsequently to *barley*, which is now the only English name used for *gerst*.

In the same manner, the effervescence, or froth, of beer was first called *beer-heym*, then corrupted into *berham*, and lastly, into *barm*.

A NEW ENGRAVING MACHINE.

THE *New York Jewellers' Circular* says:—"A Mr. Atchison, of Boston, Mass., has patented a new machine for engraved or chased groundwork on gold or plated jewellery, silver plate, or washed ware. The inventor claims that it can be applied as well to the lightest-plated surface as to solid metal, and will produce a beautiful matting on gold rolled to a thickness of note paper. The working of the machine is also said to be very simple, the engraving tools being easily removed and fitted, so that they may be changed in accordance with the kind of work to be executed. The groundwork is produced on the metal with great rapidity, the tools delivering 5335 cuts per minute, and the instrument can be worked by a child. As the sale of jewellery and silverware depends almost entirely upon the ornamentation, it need hardly be added that a machine of this description, making a very excellent imitation of hand-work, is one of considerable economical value to manufacturing jewellers. We are informed that the machine will produce fourteen styles of groundwork, claimed to be superior to satin, pearl, or sand-blast finish in depth, durability and beauty. It is also adapted to certain kinds of wood-carving, especially for panel work and for the routing of engraver's blocks.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 7d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 6½d. to 4s. 8d. (variable.)

MONTHLY RECORD OF BANKRUPTCIES,

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

BERESFORD CHARLES, trading as CHARLES SHEPPARD, Grove Street, Leeds, clock case manufacturer. August 5.
BROOK HENRY, George Street, Tamworth, jeweller. August 10.
CROCKFORD GEORGE LEPARD, 59, Mansfield Road, Nottingham, jeweller. August 2.
CUTTS SOLOMON CHARLES, 44, Lower Rosoman Street, Clerkenwell, gold and silver refiner. July 25.
CAREY WILLIAM, 257, Bute Street, Cardiff, and Station Street, Maesteg, watchmaker and jeweller. Aug. 22. At Barnard, Thomas, Tribe & Co.'s, accountants, Bristol, Sept. 12 at 2. T. H. Stephens, solicitor, Bute Crescent, Cardiff.
DAVIS FRANK ISAAC, 42, Warstone Lane, Birmingham, jewellers' factor. Aug. 16.
DORER MARIA and ADELBERT DORER, trading as DORER & SON, King's Lynn, watchmakers. Aug. 17.
GREEN RICHARD A., 82, Strand, jeweller. Aug. 12. At W. Roberts' solicitor, 15, Coleman Street. Sept. 5 at 10½.
HICKMAN SAMUEL, Leeds, watchmaker. August 3.
HALL GEORGE, 68, Great Hampton Street, Birmingham, jewellers' factor. Aug. 18. At A. B. East's, solicitor, Eldon Chambers, Birmingham, Sept. 9 at 12.
HOLT ROBERT BURBANK, Crystal Palace, Sydenham, jeweller. Aug. 19. At Queen's Hotel, Stephenson Place, Birmingham, Sept. 11 at 3. Reece & Harris, solicitors, 47, New Street, Birmingham.
KELLER PHILLIP and EMIL HAHN, 46, Hatton Garden, Middlesex, and 4, Warstone Lane, Birmingham, dealers in precious stones. August 9.
KRZECZKOWSKI STANISLAUS, Campbell Buildings, Rye Lane, Peckham, watch and clock maker. August 1.
LEAPMAN MOSS, 9, Buckingham Palace Road, Pimlico, watchmaker and fancy goods dealer. August 1.
MARKS JACOB, 2, Cardigan Street, Stockton, jeweller. August 2.
MIDWINTER CHARLES, trading as MIDWINTER & STEWART, 105A, Golbourne Road, Westbourne Park, late 5, York Place, Shepherd's Bush, watchmaker. Aug. 4.
PAGE NEWTON THOMAS, 20, King Street, Clerkenwell, manufacturing jeweller. July 29.
RAFTERY THOMAS, 305, Old Kent Road, watchmaker and jeweller. July 31.
WHITTAKER JOHN, Featherstall Road, and Victoria Market, both Oldham, jeweller and toy dealer. August 10.
WALKER GEORGE, Laurel Cottage, Highgate Lane, King's Norton, Worcestershire, late SPARBROOK, Aston, Warwickshire, brewer and jeweller. Aug. 21. At E. Jacques', solicitor, 40, Cherry Street, Birmingham, Sept. 9 at 10½.
YATES GEORGE ALFRED, Adderley Street, late Hall Street, both Birmingham, beerhouse-keeper and jeweller. Aug. 24. At A. B. East's, solicitor, Eldon Chambers, Birmingham, Sept. 11 at 12.

Trustees Appointed.

BARFOOT CORNELIUS H. (Liq.), Huntingdon, watchmaker. Trustee, Benjamin Taylor, Peterborough, high bailiff.
BENNARD WILLIAM (Bkt.), Hastings, electro plater. Trustee, Frederick S. de B. Cooper, Wallands, Silverhill, St. Leonard's.

Adjudication of Bankruptcy.

CHINN EDWARD WILLIAM, Huddersfield, jeweller. August 3.

Discharge Granted and Bankruptcy Closed.

FOXALL GEORGE (Liq.), Beckenham, Kent, late Thavies Inn, London jewellery factor. Discharge July 15.

Notices of Second Meeting.

CROCKFORD GEORGE LEPARD, 59, Mansfield Road, Nottingham, jeweller.
SILK HENRY and THOMAS S. MAY, 16, Temple Street, Bristol, watch and clock manufacturers.

Dissolutions of Partnership.

DICKESON Bros., Turl Street, Oxford, watchmakers and jewellers. June 24. Debts by Frederick Dickeson.
GREEN HENRY C. & Co., 94, Hatton Garden, Holborn, goldsmiths. June 30.
SCHULER & WOLFF, 34, Hatton Garden, jewellers. June 24.

Meeting of Creditors under Sequestration.

SCOTLAND.

KEIR JAMES, Dundee, watchmaker. W. D. Quick's, 75, Bank Street, Glasgow, Sept. 11 at 12. Consider Trustee's disch.

PATENTS.

Application for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

3113. HENRY PEARCE, of Huddersfield, in the county of York, Jeweller, and WILLIAM HENRY DOUGLAS, of Stourbridge, in the county of Worcester, Jeweller, for an invention of "Improvements in studs and solitaires."—Dated 4th August, 1876.
3244. PETER GEORGE WILSON, of the town and county of Inverness, North Britain, for an invention of "Improvements in brooches, whereby they are rendered convertible into pendants."—Dated 18th August, 1876.
3285. CHARLES AUGUST HERZOG, of 25, Bouverie Street, in the city of London, for an invention of "Improvements in watches."—A communication to him from abroad by Charles Morlet, of Geneva, Switzerland.—(Complete Specification.)—Dated 22nd August, 1876.
3309. CHARLES HARROLD, of Birmingham, in the county of Warwick, Refiner and Metal Roller, for an invention of "Improvements in the manufacture of watch pendants, and in tools or machinery employed in the said manufacture."—Dated 23rd August, 1876.
3356. FRANK MOORE, of Knowle, in the county of Warwick, Toolmaker, for an invention of "Improvements in solitaires, sleeve links, and other similar dress fastenings."—Dated 26th August, 1876.
3366. CHARLES JACKSON, of Burton-on-Trent, in the county of Stafford, Jeweller and Silversmith, for an invention of "Certain improvements in the manufacture of solitaires and studs, glove fasteners, and other like purposes."—Dated 28th August, 1876.

Grants of Provisional Protection for Six Months.

2892. To THOMAS MORGAN, Secretary of the Inventors' Patent-right Association, Limited, 21, Cockspur Street, Charing Cross, in the county of Middlesex, for the invention of "Improved watch keys."—A communication to him from abroad by John S. Birch, of New York, United States of America.
2912. To HARRISON MILL FRODSHAM, of the Strand, in the county of Middlesex, Chronometer Maker, for the invention of "Improvements in independent equi-motive escapements for watches, clocks, and other time-keepers."
2975. To GIUSEPPE ZAFFIRA, of Pentonville Road, in the county of Middlesex, Engineer, for the invention of "Improvements in the up-and-down movement for watches, chronometers, and spring clocks."
2958. To JOHN ALFRED LANGSTON, of Tavistock Street, Bedford Square, in the county of Middlesex, Architect, for the invention of "Improvements in illuminating clocks."

Notices to Proceed.

1519. JOHN COMPTON WEEKS JEFFERYS, of 14, Tottenham Court Road, in the county of Middlesex, Manufacturing Jeweller, has given the like notice in respect of the invention of "Improvements in scarf-rings and other like dress-fasteners and ornaments."
1528. WILLIAM HENRY ALFORD, of Ventnor, Isle of Wight, in the county of Hants, has given notice in respect of the invention of "Improvements applicable to finger rings, bracelets, and other similar articles."
2008. HENRY YARNLEY, of Birmingham, in the county of Warwick, Manufacturing Jeweller, has given notice in respect of the invention of "An improved catch or clasp, applicable as a fastening for solitaires, books, purses, and other articles of a like or similar nature."
3285. CHARLES AUGUST HERZOG, of 25, Bouverie Street, in the city of London, "Improvements in watches."—A communication to him from abroad by Charles Morlet, of Geneva, Switzerland.

Patent Sealed.

760. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an invention of "An improved machine for cutting diamonds and other precious stones."—A communication to him from abroad by Henry Daws Stover, of the city and state of New York, United States of America.—Dated 23rd February, 1876.

Patent which has become Void.

2671. THOMAS JAMES SMITH, of the firm of Robertson, Broomahn, & Company, of 166, Fleet Street, in the city of London, Patent Agents, for an invention of "Improvements in compensator frames for uni-metallic thermometers, clock pendulums, dead standards, and other purposes."—A communication to him from abroad by the Société Tremeshini et Cie., of Paris, 23, Boulevard de Strasbourg.—Dated 11th August, 1873.

Patents Granted in Foreign States.

UNITED STATES.

- 175,905. C. H. E. BECHERT, of Oroville, Cal., for "Ruby-pin inserters for watches."—Application filed 3rd January, 1876. "Tweezers,

with disc-shaped holding-ends to their jaws, are provided, one with a central circular hole and a notch in a flattened edge, and a holding-spring over it, and the other with a supporting notch."

- 176,043. M. H. PADDOCK, of East Clarkson, N.Y., for "Calendars for clocks and watches."—Application filed 17th March, 1876. "A calendar arranged under the dial of a watch or clock, and set in the act of winding."
- 176,060. JAMES N. RICE, of Pittston, Pa., assignor of one-half of his right to E. J. Saylor, of the same place, for "Devices for winding clocks."—Application filed 30th March, 1876. "A winding wheel upon an independent pinion-shaft, between the plates and above the main wheel-shaft, the winding power being transferred through a supplementary wheel to the main wheel."

FRANCE.

- 112,709. BASSMADJIAN, for "An apparatus for cutting and polishing diamonds."—Dated 4th May, 1876.
- 112,726. JEHLIN, for "Pendulums with rotary oscillations, and applying them to clocks."—Dated 6th May, 1876.
- 112,903. VAN TENAC, for "A mysterious clock."—Dated 13th May, 1876.

BELGIUM.

- 39,970. A. L. JUNOD-PATTUS, for an imported invention of "A remontoir watch repeating quarters, without wheels or hammers."—Dated 8th July, 1876.—(French Patent, 6th July, 1876.)
- 40,050. E. STOCKART, of Seraing, for "A compensator clock."—Dated 20th July, 1876.

PRUSSIA.

13. H. SCHROEDER, of Warin, for "An alarum for watches."—3 years.—Dated 8th June, 1876.

Invention protected for Six Months on the deposit of Complete Specification.

3285. CHARLES AUGUST HERZOG, of 25, Bouverie Street, in the city of London, praying for Letters Patent for the invention of "Improvements in watches."—A communication to him from abroad by Charles Morlet, of Geneva, Switzerland.—Was deposited and recorded in the Office of the Commissioners on the 22nd day of August, 1876, and a Complete Specification accompanying such petition was at the same time filed in the said office.

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NICKELISATION.—In Plazanet's process a bath is used of 87·5 grammes of sulphate of nickel, 20 sulphate of ammonia, 17·5 citric acid, and two litres of water. A bath much used in France is formed of a solution of four parts of nitrate of nickel in four of liquid ammonia, and 150 water in which 50 parts of sulphate of soda have been dissolved. Using a moderately weak current the operation is at an end in a few minutes. There is no need to interrupt it by taking the objects out and brushing them. When the film of nickel is of sufficient thickness the objects are withdrawn from the bath and dried with sawdust.—*American Art Journal*.

GERMAN-SILVER SOLDERING.—Pour out some spirits of salts in an earthenware dish, and then add a piece of zinc to it; next scrape clean the edges to be soldered and paint them over with the spirit of salt solution. After this is properly done apply a piece of pewter solder, and melt with a blowpipe.—*American Silversmith*.

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HOROLOGY.

(Continued.)

XVII.—DECLINATION.

IN the September number of this journal we concluded our article by promising to say a few elementary words upon the subject that gives its name to the present paper; we now proceed to do so, in as plain language as is admissible.

Declination in astral-horology has the same meaning as what it bears in its astronomical sense; in fact, without it there would be no horology worth the name, either by sun-dial or clock. We have spoken in a previous article of great circles and their arcs, and we have now to state that declination is an arc of a great circle, intercepted between a given point and the equator, and perpendicular to the latter; but the circle of declination is a great circle of the sphere which passes through the poles of the earth, and it is upon this that the declination of a star is measured. Then there is the parallax of declination in the same circle, by which the parallax of the altitude increases or diminishes the declination of a star; the same effect is also produced by refraction, or the bending of the rays of light from a direct line, this is known and can always be corrected. The declination of a plane or wall in dialling we have already given, as well as a description of the instrument called the declinator. When speaking upon this question we find ourselves

introduced to a very large field of information, indeed, information of a purely and scientific nature, that has been often reduced to mechanical demonstration. We have astral-horology, nautical astronomy, and mathematical geography, all more or less connected with astronomical declination. The equator is the dividing line or separating great circle, and when a star is either north or south of this circular line it is said to have north or south declination. Modern nautical astronomers are preferring the term "polar distance" to declination. Taking the spectator's eye as the resting point, then the angle made by one line from it to the star, and that of another line to the nearest pole (whether north or south) is called that star's polar distance. Now take the angle subtended, which will be the complement of the polar distance, and the nearest point of the equator, we shall then have the declination of the star. This again leads us on to "high ascension," which as a link in the chain must be explained.

We are told to suppose a person at the equator, looking directly eastward, and having his arms outstretched as evenly from his shoulders as are the arms of a railway signal-post. The tips of his fingers will then point to the north and south poles respectively; for at the equator those poles lie horizontally, and, consequently, a line drawn through the spectator's arms will form a part of what is termed the celestial axis, or that upon which the heavens appear to us turn. At this place every star will appear to rise straight upwards in a line with his body, whilst the great circle line, agreeing with the raising of his head, is on an even curve, without turning aside

in any direction will be the equator. And this same point of the equator will rise every day with the same star! Let us suppose that some important star rises on this point at the time when the spectator chooses to commence his astronomical day, which day always begins at the instant next past 12 at noon. It may as well be mentioned that in such a day there is no midnight, and no two sets of hours of 1 to 12; the astronomical day commences as just stated at the instant after 12 at noon, and runs on to 24 o'clock at the instant completing the next noon. There is this curious feature about it, namely, that 11 o'clock in the forenoon of the 1st of October, ordinary time, is 23 o'clock of the 30th September, astronomical time. The spectator having selected his star on the equator from which he chooses to begin his day, he will then be able to find out the time of the rising of any star, as soon the distance of the point of the equator which rises with it from his own star. Let us give an example.

The equator is divided into 360 degrees, every one of which rises, culminates, and declines in the twenty-four hours. Supposing that the spectator's star has reached a right ascension of 60 degrees, when some other star makes its appearance before his eyes on the equator where his own first appeared. Then by the same reasoning, as 60 degrees in the path of the equator are equivalent to four hours, or one-sixth of the astronomical day, 6 times 60 degrees being 360, or the whole of that day, then the second star, will always rise at four o'clock of that same day, or the fourth hour from the astronomical commencement.

Draw a straight line for the axis of the earth, making the extremities N and S for the north and south poles respectively. Then draw a sweep round from pole to pole for the horizon. Draw a second circle overhead as it were, or in an upright direction to the horizon, and mark it the meridian. Next from the central part of the horizon draw a circle at right angles up to the meridian, which circle will be the equator. Now, supposing that the first star be at 60 of the 90 degrees of the right ascension of the equator, when star the second made its appearance in the equatorial path at the horizon, it is quite clear that it is four hours; behind the first one according to the homely arithmetic given above. To our readers at a distance we may add that, by substituting the meridian for the horizon this mode of timing the stars is applicable to any latitude, and may be so used, keeping in mind that the last-named great circle always passes through the poles. Notwithstanding that the same point of the equator always comes upon every meridian with the same star, instead of astronomers using a star in this way as their starting point, they prefer the vernal equinox, a term meaning equal nights, in the spring time of the year, which is always on the 21st of March, the autumnal equinox being the 23rd of September. These equinoxes are the points where the sun in his path in the ecliptic crosses the equator of the earth on his way from north to south, or from south to north. In measuring the distance of stars for *space* we measure their point upon the equator from the vernal equinox, according to the astronomical signs in degrees, minutes, and seconds which measurement is the right ascension for *space* only. This, again, is turned into *time*, to indicate that description of space, which latter operation is called the right ascension for time. When a star is seen again on the equator, it is said to have completed a sidereal day. As this, again involves an explanation of what is a day, we cannot proceed any further with it at present; but it will come in due course. In determining the right ascension of the heavenly bodies the astronomers have resource to the Transit Instrument, which will require a description to itself by and by. It will thus be seen that declination and right ascension are convertible terms, and that they involve the use of the instrument that we have mentioned, combined with an acquaintance with spherical trigonometry. As the *Nautical Almanac* has most of the computations ready to hand, its use involves that of the chronometer. However we have not as yet reached that instrument in these papers, so must for the present defer any further observations upon it until the proper time arrives.

With respect to the mechanical demonstration of astronomical problems, a great deal has been done by the ingenious of mankind. We have before us an old time-stained volume, published about the year 1739, entitled "The Description of the Copernican, or True System of the World," in the preface to which we find the following quaint introduction to a then newly made orrery:—

"In the machine, or orrery itself, we have been very full, treating every particular part thereof, showing how it solves all the Phenomena of the Heavens. The first, that bears the name of Orrery, was made by Mr. John Rouley; but that wanted not only the comets, but also the three superior planets, Mars, Jupiter, and Saturn. So by this we see what vast improvements have been made in this machine in so short a time as 20 years. Indeed, the once famous Mr. Edward Wright, about the year 1624, being chosen tutor in the Mathematics to Prince Henry, he, by the help of some German workmen, caused to be made for that hopeful prince, a large Sphere, with curious movements, which, by the help of spring-work, not only represented the motions of the whole celestial sphere, but shewed likewise the particular systems of the Sun and the Moon, and their circular motions, together with their places and eclipses of the luminaries. There is in it a work, by wheel and pinion, for a motion of 17,100 years certainly effected, if the sphere should be kept so long in motion. This sphere, though thus made at a great expense and ingenious industry, was, in the late times of devastation, cast aside among other rubbish, and had been utterly lost and destroyed, had it not in the year 1646, been found out by Sir Jonas Moore, Knight.

The Orrery, which is here the occasion of this discourse, far exceeds any of its kind that has ever been made, not only in beauty, stateliness, and neat contrivance of all its parts, but also in the truth of its performance; for all the motions herein are a true representation of the motions of the heavenly bodies themselves. There is nothing that doth more show the force and penetration of human understanding, than these great and wonderful discoveries. There is no more certain way of comprehending the prodigious bulk of the whole mundane fabric, and the infinite wisdom of its divine contrivance, than by this machine. From hence we learn to have a most noble and magnificent motion of the whole system of nature. Now we are assured this earth we inhabit is but a small and inconsiderable part of a glorious fabric, since there are almost infinite worlds created by a Supreme and Almighty Being, which are prodigiously larger than ours."

Now, the question that seems to hold the most interest to the practical horologist is, that, as far back as 250 years ago the mechanical part of our art was sufficiently forward to construct these "curious movements" and the "help of spring work," and the "work by wheel and pinion for a motion of 17,100 years, certainly effected," &c. Of course, as will be readily understood, everything was made by hand, the eye supplying the gauge. What an amount of filing the "work by wheel and pinion," must have given.

The reader, we trust, will now have an intelligible idea of those great circles, or "declinations," which are so indispensable in the pursuit of low logical as well as astronomical science. The above somewhat curious notification of the Orrery shows by what painstaking and gradual advances horology became the practical handmaiden, or more courteously speaking, the practical sister of astronomy. At the time that the above Orrery was constructed, the art of watchmaking in this country could hardly have been more than a century in existence. When we speak of the watchmaker's art, we may be sure that watchmaker's made this Orrery, and by what we have quoted, must have made it well. But, upon the subject of declination in its bearing on horology, we shall have occasion to deal somewhat extensively with it in the future. What we have done now, has been merely to sketch what it is, so that those readers who are making themselves acquainted with the properties of dialling may have a scintillation of the principles by which solar declination, or right ascension, marks the sun's path and shows the hours by means of his shadow upon the dial.

PRECIOUS STONES.

(Continued from page 76).

HISTORICAL DIAMONDS.

RUSSIA, of all states contains perhaps the greatest number of brilliants. The Imperial treasury has three crowns, all formed of these gems. The first, that of Ivan, contains 881; the second, that of Peter the Great, has 847. That of Catherine, which is the third, is ornamented with 2536 stones. For size the first is that which bears the name of Orloff: it weighs 193 carats, and is as large as half a pigeon's egg; it adorns a sceptre. This diamond formed one of the eyes of the famous idol of Brama in the Temple of Scheringham. In the first part of the eighteenth century a French soldier perceived that the two eyes of the idol consisted of precious stones of an extraordinary size, and he determined to take possession of them. For this purpose he simulated an ardent zeal for the Brahminical religion, and by that means succeeded in acquiring the complete confidence of the chief priests. He thus obtained permission to guard the temple. During a very tempestuous night he began to take the eyes of the idol out, but only half succeeded in his attempt, as he could take but one of the two brilliants. With this he fled to Madras, where he sold it for 50,000 francs to a captain of the English navy; and he, when arrived in England, sold it quickly to a Hebrew for 300,000. From the hands of the Hebrew it passed into those of a Greek merchant, who had the good fortune to yield it to Catherine II. for 2,250,300 lire and an annuity of 100,000 lire. One of the most singular diamonds of the Russian Court is that known by the name of Schah. It has the form of an irregular prism, is of a good colour, and weighs 95 carats. It belonged anciently to the Sofi of Persia, and, lastly, to Nadir-Schah. Russia had it from some of the rebel soldiers of that conqueror.

The superb diamond called the Moon of Mountains was sold by an Afghan chief to an Armenian named Schafrass, a merchant at Bassora, for 50,000 piastres. He kept it for twelve years, and then sent his brother to Europe to try and sell it, both at the English and Russian courts. After long negotiations the latter court bought it for 450,000 silver roubles. Finally, most beautiful amongst the jewels of the Muscovite crown is the perfectly red brilliant bought by Paul I. for 100,000 roubles. There is in Russia, belonging to the princely House Youssoukoff, a diamond known by the name of the Polar Star, which is cut and very brilliant. It weighs 40 carats.

The house of Austria boasts of the beautiful yellow diamond called Grand Duke of Tuscany. It weighs 139½ carats, is cut in nine sides, and covered with facets, which form a star with nine rays. It belonged, as others of which we have already spoken, to Charles the Bold, who lost it at the battle of Morat, with another smaller one, which now adorns the tiara of the Pope.

The Pacha of Egypt has a brilliant, which also is called Pacha. It weighs 40 carats, and cost 700,000 lire. The Piggot, which in 1818 belonged to the goldsmiths Rundell & Bridges, of London, and which weighs 82¼ carats, is perhaps the same gem which was put in a lottery in England in the year 1801 for 750,000 lire. It is not very fine. During the wars of the eighteenth century in the territory of the Mahratta the diamond called Nassak was taken by the East Indian Company. It then weighed 89¾ carats. Cut by the order of the Marquis of Westminster, it was reduced to 78¾.

The treasury of Dresden contains an emerald green one very highly valued. It weighs 31¼ carats. The goldsmith Bapst, of Paris, sold a black one to Louis XVIII. for 24,000 lire. It came from the Dogni collection. The Prince of Riccia, a Neapolitan, had one of a beautiful red, which weighed 15 carats. The merchant Hope, of London, possessed one of a blue colour, weighing about 44 carats. On account of its rare perfection, it is thought to be the superb blue brilliant, recut, which belonged to the French crown, weighing 67 carats. It was stolen in 1792, and never again heard of. The Prince of Piombino has the largest brilliants in Rome. Amongst these, one weighs 25 carats, is of a beautiful form, of good colour, and limpid. It was paid to Emmanuel Godoy, formerly Prime Minister of a King of Spain, for upwards of 100,000 lire. In 1853 a negress at Bogagem, in Brazil, found one, which, when rough, weighed 254½ carats. It was bought by the Halphens, gem merchants in Paris, who named it *The Star of the South*. When cut as a brilliant by them, it only weighed 124½ carats. It is of oval form, 35 millimetres long, 29 wide, and only 19 deep.

These are the most celebrated and universally known diamonds; and we have rather enlarged on them, because amongst all other precious stones the diamond shines out as queen.

THE CELEBRATED WATCHMAKERS, GRAHAM AND TOMPION.

GRAHAM is sometimes called "an ingenious mechanic," of whose real worth Fleet-street was hardly aware when the Cumbrian Quaker died there in 1751. Farquhar has immortalized Tompion, the watchmaker, in "The Inconstant," but Graham, who was under Tompion, and was his successor, was superior to him in scientific knowledge, though Tompion invented the cylinder escapement. If Fleet-street has forgotten him, Greenwich has not; for there the spirit of the Cumbrian works beneficially through his instruments. Graham's scientific merit, however, was soon recognized by the Royal Society. George Graham was elected into the Royal Society on March 9th, 1720, and admitted, March 26th, 1720. His merit early attracted the attention of that learned body, and he was elected to the council at every alternate anniversary from the year 1722 to the year 1742. He proved himself worthy of the honours conferred upon him by contributing twenty-one papers to the "Philosophical Transactions." To open the doors of the highest guild of science in Britain to a Fleet-street clockmaker may at first sight appear no less strange than incongruous, yet further consideration will show that the Royal Society acted in an appropriate and praiseworthy manner by admitting to their council a masterworkman to whom work was not simply a profession, but a daily vocation. If the art practised by Graham was only in its initiative stage, there were minds in the society fully alive to the significance of every tentative effort that would facilitate the correct measurement of time or aid in the solution of the deep problems of astronomy. And whoever could fashion the most delicate instruments by which satisfactorily to promote these great objects affecting science, and not less the common interests of mankind, justly claimed the recognition of a true artist on a par with the astronomer himself. Scientific observations can only be made through certain media, the arrangement of which rests with the mechanician, so that art and science are mutually dependent on each other. In offering the right hand of fellowship to Graham, the society did not look upon him as a clockmaker simply, but as a man whose skill and aptitude brought to light the best means of rendering the measurement of time and the scrutiny of the heavens worthy of confidence. The following anecdote is an illustration of the reputation achieved by Graham, as well as of his honesty.

A gentleman who had ordered a watch told Graham, when the watch was delivered to him, that he was going off to India for about seven years, and that he wanted to know how far he might rely upon the regularity of the movement. "Sir," replied Graham, "it is a watch which I have made and regulated myself: take it with you wherever you please. If after seven years you come back to see me, and can tell me there has been a difference of five minutes, I will return your money." After a lapse of more than seven years the gentleman returned, and with a serious countenance said, to Graham, "Sir, I bring you back your watch." "I remember your conditions," said Graham; "let me see the watch. Well, what do you complain of?" "Why, I have had it seven years and there is a difference of more than five minutes!" "Indeed! In that case, sir, I return you your money." "What do you mean?" "I mean to fulfil my engagement!" "I would not part with my watch for ten times the sum I paid for it." "And," replied Graham, "I would not break my word for any consideration. A promise is sacred: I promised, on certain conditions, to take back the watch; and in consequence of that promise you have returned it to me, and no power on earth shall force me to violate my engagement." Graham was true to his word, and to his last day he used the watch as his regulator. There was no sham and shoddy work sent out of the shops of Tompion and Graham. Prior, in his "Essay on Learning," says that so jealous was Tompion of his reputation as a clockmaker, that he would not allow his name to appear on any of his work which was not the best of its kind. It is related that on the occasion of a person applying to him upon the subject of a watch, upon which his name had fraudulently appeared, he at once broke it with a hammer, and presented another to the person, saying, "Sir, here is a watch of my making."—*Jewellers' Circular*.

JEWELLERS' ALLOY.—The following alloy was recently patented in France:—Copper, 720 parts; nickel, 125 parts; bismuth, 10 parts; zinc, 90 parts; soft iron, 20 parts; tin, 20 parts. This is said to form a fusible, malleable metal, easily worked by a silversmith; it resists the oxidizing action of the air, and is capable of being soldered.

FINGER RINGS

(Concluded from page 83).

OUR subject concludes with the last stage of all, and connects itself with death. Mourning rings, as remembrances of those loved ones who have preceded us to the land of spirits, have always been cherished in Christian lands. Lord Eldon wore a mourning ring in memory of his wife, and desired in his will that it might be buried with him.

The practice of offering rings at funerals is introduced as an incident in "Sir Amadace." Anne of Cleves, who survived Henry VIII., left, by her will, several mourning rings of various values to be distributed among her friends and dependents. Dr. Wolcot wrote some elegant lines, very different in tone from the one usually employed by him, on the Princess Amelia's mournful present to her father, George III.—

"With all the virtues blest and every grace,
To charm the world and dignify her race,
Life's taper losing fast its feeble fire,
The fair Amelia thus bespoke her sire :—
'Paint on the bed of sickness lying,
My spirit from its mansion flying,
Not long the light these languid eyes will see,
My friend, my father, and my king,
Receive the token and remember me!'"

Memorial rings were sometimes made to exhibit a small portrait, and, on some occasions, to conceal one beneath a stone. This is the case with the seven rings given away at the burial of Charles I. One of these is in the Londesborough collection, and is described as follows:—"Gold, with square table-faced diamond on an oval face, which opens and reveals beneath a portrait of Charles in enamel. The face of the ring, its back, and side portions of the shank, engraved with scroll-work, filled in with black enamel."

Another of these rings is still more interesting:—"It was of pure gold, plain, and without jewellery or ornament of any kind; on the top of it was an oval of white enamel, not more than half an inch in longitudinal diameter, and apparently about the eighth of an inch in thickness; the surface was slightly convexed, and divided into four compartments; in each of these was painted one of the four cardinal virtues, which, although so minute as to be scarcely perceptible to the clearest sight, by the application of a glass appeared perfectly distinct; each figure was well-proportioned, and had its appropriate attribute. By touching a secret spring, the case opened and exposed to view a very beautifully painted miniature of the unfortunate Charles, with the pointed beard, mustachios, &c., as he is usually portrayed, and, from its resemblance to the portraits generally seen of this monarch, wearing every appearance of being a strong likeness."

The ring sold at Strawberry Hill sale had the king's head in miniature behind a death's head, between the letters C. R. The motto being "Prepared be to follow me." Charles II.'s mourning ring was inscribed "Car. Rex Remem—obit—ber—30 Jan., 1648."

Mr. Wright, in "*Miscellanea Graphica*" (1857), describes a gold mourning ring "formed of two skeletons, who support a small sarcophagus. The skeletons are covered with white enamel, and the lid of the sarcophagus is also enamelled, and has a Maltese cross in red on a black ground studded with gilt hearts, and when removed displays another skeleton." The Earl of Crawford and Balcarres tells a sad story of a ring in his memoir of Lady Anne Mackenzie. Colin, Earl of Balcarres, when a youth at the court of Charles II., was taken very ill of a fever. Messengers arrived almost hourly to make inquiries after his health on behalf of a lady who had seen him presented at court, viz., Mdle. Mauritia de Nassau, sister of Lady Arlington and Lady Ossory, and a kinswoman of William of Orange. Lord Balcarres paid his respects to the young lady on his recovery, and soon the day of their marriage was fixed. The wedding party was assembled in the church, but no bridegroom appeared. He had forgotten the day, and was found in his dressing-gown and slippers quietly eating his breakfast. On being reminded of his engagement he hurried to the church, but in his haste he left the wedding ring in his escritoire. A friend in the company gave him a ring; he put his hand behind his back to receive it, and, without looking at it, he placed it on the finger of his bride. It was a mourning ring with a death's head and crossed bones engraved upon it, and the bride, on perceiving it at the close of the ceremony, fainted away. The ill omen made such an impression upon her mind that, on recovering, she declared she should die within a year. Her presentiment was but too truly fulfilled, for she died in childhood in less than a twelvemonth after.

When Diana of Poitiers became mistress of Henry II. of France

she was a widow, and the complaisant court not only adopted her mourning as the favourite colour, but wore rings engraved with skulls and skeletons. Rings with these devices were not necessarily mourning rings, but were worn by those persons who affected gravity. Luther wore a gold ring with a small death's head in enamel, which is now preserved at Dresden. *Biron* in "Love's Labour Lost," refers to "a death's face in a ring," and in *Baumont and Fletcher* we find:—

"I'll keep it
As they keep death's head in rings,
To cry memento to me."

—"Chances," Act I., Scene 3.

We have now passed in review many varieties of rings, and we cannot but notice the little value that is set upon them in the present day, as compared with their importance in days gone by. There are now no official rings, no rings to cure all diseases and save us from all dangers; but, instead of all this, they have sunk into mere ornaments. There is still, however, one ring that is associated with some of the dearest feelings of our nature, viz., the plain gold ring, as it is called, though why it should be plain we do not know. Why should it not be engraved with all the beauty that heart can lavish upon it? and why should not a beautiful poesy be written within its hoop? But it is probably useless to suggest such a change in universal fashion.

The facts we have gathered about finger-rings are scattered over the history of many ages and nations; and in the selection of illustrations we have been guided by their historic value as well as their artistic merits, so that they may be referred to as authorities to test the age and country of other works of their class, if brought to them for comparison.

PASSAGE OF THE EARTH THROUGH THE TAIL OF A COMET.

IN June, 1861, M. Liais, the celebrated astronomer at Rio Janeiro, from observations which he had made of the great comet of that year, which had not as yet become visible in Europe, became convinced there was a great likelihood that the earth would come in contact with one of the tails of the comet. M. Liais proved beyond question that on the 19th of June, 1861, the earth really did pass through one of the comet's tails, the moment of contact being 12 minutes past 6 a.m.; and the earth must have been *wholly immersed in the tail for about four hours*. Yet it had no perceptible influence upon the weather—a very remarkable fact, adding reason to suppose that cometary matter is some millions of times rarer than our atmosphere. This phenomenon had never before occurred, according to the dictum of Arago, the astronomer. Lord Wrottesley, in 1860, remarked that when the comet of Encke returned, its motion was continually accelerated, and it was consequently drawn nearer to the sun. "The final result," says Lord Wrottesley, "will be that after the lapse of ages this comet will fall into the sun." This body, a mere hazy cloud, continually flickering, as it were, like a celestial moth, round the great luminary, is at some distant period destined to be mercilessly consumed. Professor William Thomson suggests that the heat and light of the sun may be from time to time replenished by the falling in and absorption of countless meteors which circulate round him; and here we have a cause which may accelerate or produce such an event.

A MAYORAL CHAIN.

MESSRS. T. & J. BRAGG, of Birmingham, have recently manufactured a gold chain and badge of office of unusual excellence and workmanship as a mayoral chain for the Corporation of Blackpool. The chain and badge were designed by Mr. J. W. Fouks, and this fact, together with its manufacture by Messrs. Bragg, who have attained such celebrity for the execution of high class work, is sufficient guarantee that the article is one which will reflect credit not alone on the manufacturers and designer, but also on the generous donor, Mr. W. H. Coeker, J.P.

The grand tenor bell in the new set of bells and chimed about to be placed in the belfry of St. Paul's Cathedral is to be presented by the Court of Common Council of London. All the other bells have been presented by City companies.

ALUMINIUM, ITS FUTURE IN THE ARTS, AND ITS PROBABLE INTRODUCTION IN THE MANUFACTURE OF JEWELLERY, &c.

IT is now about twenty years since the celebrated French chemist, Deville, succeeded in demonstrating the possibility of producing the metal aluminium upon the large scale; but, up to the present, the extent to which this interesting and praiseworthy invention has been utilized has but to a slight degree realized the sanguine expectations which intelligent minds of all professions have been accustomed to associate with it. So important, indeed, were the fruits of Deville's first investigations deemed to be, that they were at once invested with the dignity of royal patronage, and the first works for the manufacture of the new metal were shortly thereafter erected at Javelle, near Paris, from the private purse of the late Emperor of the French. It was expected that the new product would at once find its way into the useful arts as an effective and valuable substitute for many other metals. That these expectations were well founded will be apparent from the characteristic and very exceptional properties of the metal. A bright, pure surface of aluminium possesses a greyish-white colour, something between that of zinc and tin. Its extreme lightness is one of its very distinguishing properties, and affords an immediate means of identifying it from every other metal. Its specific gravity is but 2.5 (water=1), from which it appears that it is about three times lighter than copper, four times lighter than silver, and nearly eight times lighter than gold. When struck, it emits a loud, clear, musical tone, which has been compared with that of crystal glass. The keen observing powers of the French chemist did not permit this property to pass unnoticed. He suggested the employment of aluminium for bell-metal, and in the year 1868 presented to the Royal Institution of Great Britain a bell $1\frac{1}{2}$ foot in diameter, which proved to possess a most exquisite tone, and which, despite its not inconsiderable dimensions, weighed no more than 44 pounds.

The metal may be hammered out into the thinnest leaves, rolled into plates or sheets, and drawn into the finest wire. Its hardness approaches that of fine silver, and its tensile strength equals that of copper. Its melting point lies at 700 degrees C. (about 1300 Fahr.), or between that of zinc and silver; and it is worthy of note that it fuses with extreme slowness, and does not vaporize even in the heat of the blast furnace. Generally speaking, the metal is workable to an extraordinary degree, and it may be filed, turned, pressed, engraved, and coined quite readily. In compact masses the metal is quite indifferent to atmospheric influences, and even when being smelted it does not sensibly oxidize. It must be remarked, however, that the properties above enumerated are predicated upon the presumption that the metal is free from impurities.

In the manufacture of jewellery, and other articles of luxury, it is probable that aluminium may in time play an important part, though it is scarcely possible for it to ever rival the popularity of silver in these uses. In Paris, which, by the way, has always remained the head-quarters of the aluminium industry, it appears to be employed to a considerable extent for elegant inlaid work upon jewel and dressing cases, fans, &c., for lids and covers of glasses, and for a variety of small articles of *galanterie*. From what has been done in this direction we can estimate its fitness for a thousand elegant articles of taste, fancy, and utility, when once its popularity is established before the world at large, which is now scarcely cognizant of the existence of such a metal as aluminium. The makers of clocks and watches, of surgical and musical instruments, and of artificial teeth, as well as the manufacturers of such articles as seals, pen-holders, paper-weights, shirt and sleeve buttons, smokers' and sportsmen's necessities, canes, riding-whips, harness decorations, statuettes, gas-fixtures and lamps, &c., would without doubt derive much advantage and profit from the employment of aluminium, and sooner or later its peculiar fitness for these uses will be recognized. For the manufacture of philosophical and engineering instruments, and especially the latter, the indifference of aluminium to atmospheric influences, and its extreme lightness, have of late met with general recognition, and the employment of the metal for these uses is steadily growing in favour.

According to M. Morin, the director of the manufactory of Nanterre, very homogeneous alloys are obtained with copper and 5, 7 1-2 and 10 per cent. of aluminium. The alloys with 5 and 10 per cent. of aluminium are both of a golden colour, whilst that with 7 1-2 per cent. has a greenish tint. Even so small an addition as 1 per cent. of aluminium to copper considerably increases its ductility and fusibility, and imparts to it the property of completely filling the mould, making a dense casting free from air-bubbles.

At the same time the copper becomes more resistant of chemical reagents, increases in hardness without losing in malleability, and unites in itself the most valuable qualities of bronze and brass. A copper alloy, with 2 per cent. of aluminium is said to be used in the studio of Christoffe, in Paris, for works of art. It works well under the chisel and graver.

The true aluminium bronzes, according to Rudolph Wagner, were first made by John Percy, in 1856. They are alloys containing 90 to 95 per cent. of copper, with 10 to 5 per cent. of aluminium. The direct mixture, by first fusion, of 10 parts of aluminium and 90 of copper, gives a brittle alloy, which, however, increases in strength and tenacity by several successive fusions. At each operation a little aluminium is lost. After the compound has been melted three or four times, however, the proportion of aluminium does not appear to change, and the alloy may be again remelted several times without alteration. These fusions are effected in crucibles. The aluminium bronze is homogeneous, and possesses sufficient expansion to fill the remotest parts of the mould. It affords sharp castings that can be worked more readily than steel. Aluminium bronze may be forged at a dull-red heat, and hammered until cooled off without presenting any flaws or cracks. Like copper, it is rendered milder and more ductile by being plunged into cold water when hot. The bronze polishes beautifully, and possesses great strength—according to Anderson's experiments, an average of 75,618 1-2 lbs. per square inch. The resistance to compression is feeble. From the experiments of Col. Strange on the relative rigidity of brass, ordinary and aluminium bronze, it appears that the last-named is forty times as rigid as brass, and three times as rigid as ordinary bronze.

Aluminium is manufactured by decomposing the double chloride of aluminium and sodium, with the aid of metallic sodium. The sodium is obtained by heating to redness a mixture of 100 parts of calcined soda, 15 parts of chalk, and 45 parts of coal. The chloride of aluminium is prepared by passing chlorine gas over a moderately-heated mixture of pure alumina (obtained either from alun or the mineral bauxite), common salt, and coal-tar. This operation is conducted in an iron gas-retort, and the result of the interaction of the several substances present is the combination of the coal-tar with the oxygen of the alumina, and the production of aluminium chloride, which unites with the chloride of sodium (common salt), forming a double salt, which volatilizes and is passed off into a separate chamber, where it condenses. From this method of obtaining the chloride, it is impossible to keep it free from chloride of iron, for which reason the Parisian aluminium is invariably impurified therewith. From this double chloride of aluminium and sodium the metallic aluminium is obtained, either by passing it in the form of vapour over a heated surface of metallic sodium, in a simply-constructed and connected system of iron cylinders appropriately heated, or the materials are at once mixed and heated.

Rose, of Berlin, instead of the artificially-prepared aluminium chloride, employed the mineral kryolite (a natural compound occurring in deposits of considerable magnitude in Greenland, and consisting of fluoride of aluminium and sodium) quite successfully. By heating this mineral with sodium, metallic aluminium and fluoride of sodium are produced, and the latter compound is gotten rid of by treating the resulting mass with caustic lime. Of late the metal has also been manufactured from the mineral bauxite.

At present there are four aluminium works in existence, of which three are in France and one in England. Their total production amounts to about 3500l. yearly, of which 2000l. are produced in France, and 1500l. in England.

THEODORE ROHRER, a watchmaker of Newcastle, has invented a piece of mechanism which is thus described:—"It consists of a set of gold studs, in one of which is a miniature watch, which keeps excellent time. The combined weight of the two studs and watch, which are all connected together, is $1\frac{1}{2}$ oz. The face of the watch is about the size of a silver three-cent. piece, and with its surroundings of gold looks much like a small compass. When the watch and studs are on the shirt-front they are about 2 inches apart, and by turning the upper one (in the same manner that a stem winding watch is wound) the time-piece is wound. In setting the hand the lower stud is revolved. The most remarkable thing about the time-piece is that it is not like ordinary watches, but has a dial resembling that of a clock. The pendulum will move correctly in whatever position the watch is placed, even when it is reversed and run at the top instead of the bottom.

HISTORY OF ASTRONOMY.

(Continued from page 31.)

A FEW years after the destruction of the Alexandrian library, those very Arabs, who had committed such devastation amongst those valuable stores of learning, began to study such treatises on the sciences as had escaped the sad catastrophe; they paid particular attention to those that treated on Astronomy, and even some of the Caliphs* became not only patrons of, but proficient in, this interesting study.

Haroun Al Raschid, who reigned in the latter end of the eighth, and the beginning of the ninth century, and makes so conspicuous a figure in many of the Eastern tales, was a munificent patron of scientific men, and is said to have sent as a present to Charlemagne, a clepsydra, or water-clock, which pointed out the hours, by curious mechanical contrivances, which, were then considered as an astonishing instance of ingenuity; but were probably, in reality, inferior to the common cuckoo-clock of the present day. Almansor, the son of Haroun, trod in his father's steps, and even went beyond him in his zeal for the promotion of useful knowledge. By his order the obliquity of the ecliptic was ascertained, but authors differ as to the result, and a degree of the meridian was measured on the plains of Singia, near the Red Sea. Thus, the Arabs merit praise, not only for having preserved the scattered relics of ancient learning, but for attempting to add to the stores of science by observations and discoveries of their own. Many of the works of the Arabian astronomers have been translated into Latin, and are still extant.

The Persians, the Indians, and the Chinese, attended early to the study of this science; the first mentioned people fix the length of the solar year at three hundred and sixty-five days six hours; and to render this computation convenient, they dropped the six hours, and instead thereof, intercalated a month of thirty days once in one hundred and twenty years, which answered the same purpose as the extra day in our bissextile, or leap-year; this being at length found too much, Omar Cheyham an astronomer of that nation, improved the calendar by adding a day every fourth year, for seven periods of four years each, and then a day on the fifth year for the eighth period, and so on continually, which comes near the truth.

Even the barbarous Tartar princes patronized Astronomy Houlagon Khan, who conquered Persia, about 1264, built an observatory in the city of Maragha, and established a kind of college of astronomers, over whom he placed Nassir Eddin, as president. To this man the world is indebted for several astronomical works. Ulugh Beg, grandson of Tamerlane, was a munificent patron of the science, and established an astronomical academy, at Samarcand, of which he himself became one of the members; it is said, that in this academy was a quadrant of one hundred and eighty feet radius, but so unwieldy an instrument must have been rather for show than use. Ulugh Beg published some works which are still extant, the chief of which was, a catalogue of the stars, and some astronomical tables, the most perfect then known in the East. Since this period Astronomy has declined in Persia, and given place to astrological fancies, so that the modern Persians scarcely know how to make a rude calculation of an eclipse.

It is usual to consider the Turks as exceedingly illiterate and ignorant of the sciences; almost as early as the foundation of their empire, in the thirteenth century, colleges were instituted, and Geometry and Astronomy taught, as they still are; the latter principally for its indispensable use in the study of judicial astrology† to which they are much devoted. They are said to be in possession of many books saved from the destruction of the Alexandrian library, the contents of which have never been published; but they have never yet added one discovery to the sciences.

About the same time that the Turks began to promote the study of astronomy, Oktay Khan, one of the Tartar princes on the throne of China, exerted himself for the same purpose in that country; he sent for learned men from Arabia, Persia, &c.; constructed colleges, purchased books, and caused proper instruments to be fabricated for the advancement of this science and geography. But the Chinese, from the nature of their language, and other causes, labour under disadvantages in the study of sciences which all their diligence will

* Caliph, the sovereign of the Saracens, in whom was vested absolute authority in all matters relating both to religion and authority.

† Astrology is usually divided into two parts, natural and judicial. Judicial Astrology is that which pretends to foretell moral events, that is, such as have a dependence on the free will and agency of man as if they were directed by the stars. This art which owed its origin to the practises of knavery on credulity is now universally exploded by the intelligent part of mankind. Natural Astrology is the predicting natural events from natural causes; as the changes of the weather, winds, storms, thunder, hurricanes, floods, earthquakes, &c. &c.

not enable them to overcome; although many of their princes, and especially Hupilay, the brother of Houlagon, already mentioned, exerted themselves to the utmost, by assembling learned men, by establishing important regulations by expending large sums in forming libraries, and procuring instruments, Astronomy has made no great progress in this vast empire, nor is it at present in a state to be compared with European acquisitions.

The thirteenth century produced many celebrated astronomers in Spain, at the head of whom is Alphonso X.,* King of Castile and Leon, to whose care and munificent management of the science we owe the Alphonsine Tables. Nor was astronomy neglected in England; so early as the eighth century, the venerable Bede, or Bede, was a proficient in it, as far as the science was then known; and A.D. 1230, John de Sacro Bosco, another Englishman, wrote treatises on the astrolabe, and the calendar; and Roger Bacon, a Franciscan friar, astonished all Europe by his proficiency in natural philosophy and astronomy. It would occupy much space unnecessarily to enumerate all the authors who have rendered themselves benefactors of mankind by discoveries in the valuable science; we must content ourselves, therefore, with noticing those only who have enriched it by their labours in an eminent degree.

In the fifteenth century an endeavour was made by Cardinal de Cusa to introduce the *true system of the universe*, attempted in vain by Pythagoras, two thousand years before, and by many subsequent philosophers, but men's minds were not yet prepared for this truth, and it was again rejected.

The next astronomers of note were Purbach and his pupil, Regiomontanus,† the former of whom made a translation of the "Almagest" of Ptolemy into Latin, more correct than former editions, and made great improvements in astronomy, in the construction of astronomical instruments and celestial globes, marking on the latter the progress of the stars in longitude, from the time of Ptolemy to the era in which he lived. Being cut off at an early age by death, his friend and disciple, Regiomontanus, was invited by the senate of Nuremberg to reside in that city, where he built an observatory and made numerous observations on the stars, from which he corrected, or enlarged, the ancient theories.

He had, likewise, an opportunity, in 1472, of observing a comet and some of the phenomena attending its progress. In 1474 he was invited to Rome by Pope Sixtus IV. to assist in reforming the calendar, but his premature death by the plague, or, as some think, by poison, prevented the accomplishment of this project. He was succeeded at Nuremberg by Waltherius, whose observations, together with those of his predecessor, were after his death collected and published, in 1544, by order of the senate. The successor of Waltherius was Werner, who observed the motion of the comet of 1500, and showed that the motion of the fixed stars, usually called the precession of the equinoxes, is $1^{\circ} 10'$ in 100 years; he found also, that the obliquity of the ecliptic is only $23^{\circ} 28'$; he likewise recommended that method now universally practised of finding the longitude at sea by observing the moon's distance from the fixed stars, and constructed planitarius according to the Ptolemaic system. Werner died in 1528.

Dominic Maria Novara, of Bologna, claims our notice, not so much for his superior knowledge, or the importance of his labours in the cause of science, as for his having instructed the celebrated Copernicus in astronomy.

This great man, who was a native of Thorn, in Prussia,‡ born February 19, 1473, was dissatisfied with the popular theory, especially as he found that some of the phenomena by Venus could not be solved by the Ptolemaic hypothesis. He was led to the discovery of the true system by the mention he found of the opinions of Pythagoras, in the works of Cicero, Plutarch, and others. So powerful, however, was the influence of superstition on the minds of men in general, and of the clergy of that day in particular, that he did not venture to publish the book which he had written on the subject, until a short period before death removed him from the fear of man.

Yet altogether his system accounted most satisfactorily, rationally, and simply for the direct and retrograde motions, and occasional stationary appearance of the planets, and many other phenomena which could not be explained by the commonly-received doctrine. The opposition of the clergy, who represented it as heretical and revolutionary to the Holy Scriptures, prevented for a long time its receiving that attention and support which it deserved, but *magna est veritas et prevalebit*, and the discovery of the telescope soon after so powerfully seconded the dictates of reason by the result of the observations it enabled philosophers to make, that it forced its way in spite of opposition and danger.

(To be continued.)

* Succeeded to the Crown in 1252. † His real name was John Mullar.

‡ Prussian, Poland.

WORK IN GOLD AND SILVER OF THE FOURTEENTH AND FIFTEENTH CENTURIES.

At a time when banking was unknown, property was converted into plate, as a most convenient mode of retaining it. Decorative plate increased the public state of its owner, was a portable thing, and could be easily hidden in time of danger or pledged in time of want. Hence the nobility and gentry of the fourteenth and fifteenth centuries gave abundant employment to the goldsmith. Cellini, in his memoirs, has noted many fine pieces of ornamental plate he was called upon to design and execute, and one of the finest still exists in the Kunst-Kammer, at Vienna—the golden salt-cellar he made for Francis of France. The “salt” was an important piece of plate on all tables at this period; and to be placed above or below it indicated rank or honour done to any seated at the banquet. The accompanying engraving delineates a very remarkable salt-cellar, being part of a collection of antique plate formed by the late Lord Londesborough.

This curious example of the quaint designs of the old metal workers is considered to have been the work of one of the famous Augsburg goldsmiths at the latter part of the sixteenth century. It is a combination of metals, jewels, and rare shells in a singularly grotesque general design. The salt was placed in the large shell of the rare *pecten* of the South Seas, which is edged with a silver-gilt rim, chased in floriated ornament and further enriched by garnets; to it is affixed the half-length figure of a lady, whose bosom is formed of the larger *orange coloured pecten*, upon which is fixed a garnet, to represent a brooch; a crystal forms the caul of the head-dress, another is placed below the waist. The large shell is supported by the tail of the whale on one side, and on the other by the serpent which twists around it; in this reptile's head a turquoise is set, the eyes are formed of garnets and the tongue of red onyx. The whole is of silver-gilt, and within the mouth is a small figure of Jonah, whose adventure is thus strangely mixed with the general design. The sea is quaintly indicated by the circular base chased with figures of sea-monsters disporting in the waves. It would not be



easy to select a more characteristic specimen of antique table plate. The inventories of similar articles once possessed by the French King, Charles V., and his brother, the Duke of Anjou, King of Naples and Provence (preserved in the royal library, Paris), give descriptive details of similar quaint pieces of art manufacture, in which the most grotesque and heterogeneous features are combined, and the work enriched by precious stones and enamels. Jules Labarte observes, “The artists of that period indulged in strange flights of fancy in designing plate for the table, they especially delighted in grotesque subjects, a ewer or a cup may often be seen in the shape of a man, animal, or flower, while a monstrous combination of several human figures serves to form the design of a vase.”

But quaint and fanciful as were the works of the Parisian goldsmiths, they were out-done by the grotesque designs of the German artificers. They invented drinking-cups of the strangest form: the whole animal kingdom, fabulous and real birds and sea monsters, were constructed to hold liquids. A table laid out with an abundance

of this strangely-designed plate must have had a ludicrous effect. Many of their works, though costly in character, refined in execution, and thoroughly artistic in detail, are absolute caricatures. There is one in Lord Londesborough's collection, and another in that of Baron Rothschild's, made in the form of a bagpipe, the bag holds wine and is supported on human feet; arms emerge from the side and play on the chanter, which is elongated from the nose of a grotesque face; the hair is a mass of foliage. Dozens of similar examples might be cited of the most extraordinary invention, which the metal-workers of the seventeenth century particularly gave their imaginations licence to construct. Indeed the German artists of that period seem to have had a spice of lunacy in their compositions, and the works of Breughel were rivalled and outdone by many others whose fancies were of the most unearthly type. Salvator Rosa in Italy, and Callot in France, occasionally depicted what their grotesque and mystic imaginings suggested, and Teniers gave the world witch pictures, but for the weird and wondrous, Germany has always carried the palm in art as in literature.

ON THE RECOVERY OF SILVER FROM CAST-IRON CRUCIBLES.

IN a recent number of Dingler's *Journal*, two Vienna chemists, named Tavorsky and Priwozuit, described the new methods for obtaining the silver absorbed by cast-iron crucibles used in some mints and other establishments for fusing silver and its alloys. A cast-iron crucible can be used ten to fifteen times for fusing silver; then the cracks are so considerable that it must be thrown aside. These crucibles were formerly broken up, and the bottoms and other portions, which contain much silver, thrown into the very impure mother liquor from the crystallization of sulphate of copper. This liquor is not easily utilized in any other manner; but on putting in the iron the copper is precipitated, while the iron goes into solution. The cement copper thus prepared, and containing all the silver, along with the graphite, silica, and other insoluble constituents of the cast-iron, is treated in the usual manner for the separation of the silver. This process, however, is tedious, and the amount of material to be worked is increased instead of being diminished, for 100 lbs. of cast-iron yields about 113 lbs. of cement copper.

The late director of the mint at Vienna, Von Schrotter, proposed a method for overcoming this difficulty. The crucibles are first broken up, and then dissolved in dilute sulphuric acid without heat. To avoid the trouble of evaporating a large quantity of water, in order to crystallize the green vitriol, in the first experiment the sulphuric acid was only moderately diluted, and consequently large quantities of anhydrous protosulphate of iron separated and enveloped the undissolved pieces of iron, protecting them from the action of the acid. As soon, however, as the acid was diluted to 20° B. the iron dissolved rapidly. Where chamber acid can be easily obtained, it would doubtless be the cheapest. Even with acid of 60° B. it is not expensive, and the latter offers the advantage that the heat generated in diluting it helps the reaction and hastens the solution. The iron is dissolved in wooden vessels lined with lead, 12 to 15 feet long, 6 feet wide, and 20 inches deep, with a grating made of lathes, about 8 inches from the bottom, on which the pieces of crucible are placed. As the solution becomes more concentrated it sinks to the bottom, and the iron is continually brought in contact with fresh acid. If the precaution be taken to cover the vessel tightly, the extremely disagreeable gases evolved will not prove a serious disturbance.

In from ten to fourteen days the acid becomes saturated, and the solution settles and has a concentration of 20° B. By evaporation to 66° B. the green vitriol crystallizes out. The insoluble residue amounts to about 20 per cent. It contains all the silver, silica, graphite, sesquioxide of iron, copper, and small quantities of sulphur and phosphorus. The larger pieces of silver are picked out, and the smaller are obtained by sifting and amalgamating the residue. Only the old silt and the amalgamation residue, which still contains 1.4 per cent. silver, are worked over in the silver works.

This process of recovering silver is much more rapid than the method previously in use. It has the advantage that 80 per cent. of iron is removed before proceeding to the recovery of the silver, so that the argentiferous material is reduced to one-fifth its original weight. The experience of those who have employed it in Vienna show that it is thoroughly practicable, and that the green vitriol produced pays for the labour.

In the Royal Imperial Mint at Vienna 315 old cast-iron crucibles, weighing 115,192 lbs., have been treated in this way, producing 405,574 lbs. of commercial sulphate of iron. The weight of the residue was 23,038 lbs. The poorer portion, and the residue from amalgamation, weighing 13,429 lbs., was smelted. Nearly 737 lbs. of silver was obtained. The per-centage of silver in the cast-iron is calculated at 0.64 per cent. The amount of silver in a cast-iron crucible depends on the richness of the alloy melted in it; those used for rich alloys, of course, contain more silver than those in which poor ones are melted. Most of the crucibles worked up so far had been used for the alloy from which the Austrian small change is made, and which contains only from 45 to 50 per cent. of silver. The results obtained from those in which alloys containing 83.5 per cent. are fused will, no doubt, be more favourable.—*American Art Journal*.

THE watch of Aldul Aziz is in Paris, being altered for the new Sultan. The initials and signature on the case are being changed into those of Mourad V., and the name of the watch, formerly "Azzie," is now "Mouradie." Every time the case is opened the watch winds itself, and the face marks both French and Turkish time.—*Jewellers' Circular*.

GREENWICH OBSERVATORY.

ABOUT 200 years ago England began to take a lead in the mercantile commerce of the world; her ships were daily passing across the Atlantic, and India also was beginning to attract her attention. It was, therefore, of the utmost importance that navigators should be enabled to find their longitude when at sea, independently of watches or clocks; and a reward was offered to any one who should discover a method by which this result might be obtained. The plan proposed was that the angular distance of the moon from certain stars should be calculated beforehand, and published, so that, for example, it might be stated that at 10' 5" past 9 on such a day the moon should be distant from Mars 40°. If, from a ship in the middle of the Atlantic, Mars and the moon were found to be 40° apart, then it would be known that the time in England was 10' and 5" past 9. Here then was one item ascertained, and the method was a good one; but in consequence of the want of accuracy as regards the moon's motions the exact positions of the stars, it could not be practically carried out. Under these circumstances, Charles II. decided that a national observatory should be built, and an astronomer appointed; and a site was at once selected for the building. Wren, the architect, selected Greenwich Park as the most suitable locality, because from thence vessels passing up and down the Thames might see the time-signals, and also because there was a commanding view north and south from the hills selected for the site. The observatory was completed in 1676, and Flamsteed, the chief astronomer, immediately commenced his observations, but with very imperfect instruments of his own. During thirty years Flamsteed laboured indefatigably, and formed a valuable catalogue of stars, and made a vast collection of lunar observations. He was succeeded by Halley, who carried on similar observations; and from that time to the present Greenwich Observatory has been our head-quarters for astronomical observations.

The work carried on at Greenwich is entirely practical, and consists in forming a catalogue of stars and planets, and so watching them that every change in their movements is at once discovered. Now that this work has been performed for several years, the movements of the principal celestial bodies have been so accurately determined that the *Nautical Almanac*—the official guide on these subjects—is published four years in advance, and thus we find that on a particular night in 1868 the moon will be at a certain angular distance from a star, and the second satellite of Jupiter will disappear at a particular instant. On the exterior walls of the observatory there is a large electric clock, which, being placed in "contact" with the various other clocks in the observatory, indicates exact Greenwich time. The face of this clock shows twenty-four hours, so that it requires that a novice should look at it twice before comparing his watch. On the left of this clock are metal bars let into the wall, each of which represents the length of a standard measure, such as a yard, foot, &c. And let us here say a few words about these standards. To the uninitiated a yard is simply three feet, and a foot is twelve inches—an inch being, we are told in our "tables," the length of three barleycorns. Now, as the length of a barleycorn varies considerably, it requires something more definite than this to determine our national measures. Thus the question, what is a foot? is more difficult to answer than at first sight appears. Many years ago the French perceived the difficulty appertaining to the national standard, and they, therefore, decided that a metre should be the ten-millionth part of one-fourth of the earth's circumference—that is, ten-millionth of the distance from the equator to the Pole. But here another difficulty was encountered, because different calculators found this arc of different lengths. By law, however, it was decided that one measurement only was correct, and so the meter was fixed at 30,794 Paris feet; though since then more accurate observations and improved instruments have shown these measured acres to have been very incorrectly ascertained, and thus the French method failed when practically tried.

The length of a seconds pendulum oscillating in a certain latitude has been our method of obtaining a standard; but this also has its weak points, so that to obtain a constant standard it is necessary to have some pattern which is unchangeable, and thus a metal has been chosen that expands or contracts but little either with heat or cold; and this, at a certain temperature, is the standard measure, and such a standard may be seen on the exterior wall of Greenwich Observatory.

On entering the doorway—which is guarded by a Greenwich pensioner, who will possibly first peep at the visitor, in order to see who the individual may be who is desirous to tread within the sacred precincts—one finds a court-yard, on the left of which are the

transit-room, the computing-room, and the chronometer-room. The transit-room takes its name from the instrument therein, which is a large "transit." This consists of a large telescope, the outside of which is not unlike a heavy cannon, as it is of solid iron. The instrument is supported by trunnions, which allow the telescope to be elevated or depressed to point south or north, and, in fact, to make a complete revolution, but never to diverge from the north or south line. The magnifying power of this instrument is not very great, so that it admits plenty of light, for it is intended, not as a searcher for or for gazing at celestial objects, but for the purpose of noting the exact time at which stars and planets pass south or north of Greenwich. Upon looking through the telescope, the observer's eye is first attracted by a vertical row of what seem to be iron bars, placed at equal distances from each other. These, however, prove to be only spiders' webs, and are used for the purpose of taking the time of passage of a star over each wire, and thus to ascertain the exact instant of its being in the centre of the telescope. During even the finest and calmest nights there is occasionally found a tremulousness in the instrument, which, as it is rigidly fixed to the walls of the building, must be due to a slight vibration in the ground itself. Thus, many a feeble earthquake unfelt by the outsider may be perceived by the astronomer by the aid of his delicate instruments.

The various stars seem to be travelling at an immense rate when seen in the field of the transit telescope, and it is really nervous work noting the exact time when each wire is passed. The experienced observer, however, not only will give the minute and second, but also the decimal of a second when the star was on the wire. The result is obtained by counting the beats of a clock, the face of which is opposite the observer. Thus, if at three the star seems as much short of the wire as at four it had passed it, then 3.5 might be the instant of "transit."

At noon each day the sun's passage is observed by nearly the whole staff of observers. One individual looks through the telescope and gives the time for each wire, while others examine a variety of micrometers in order to ascertain the fractional parts of seconds, &c., these micrometers being placed at the side of the instrument.

In the morning, the principal work consists in making what are termed the "reductions" to the observations of the previous night. These reductions are the corrections requisite for the slight instrumental inaccuracy, for the refraction of the atmosphere, and for the known constant error of the observer. When, therefore, a bright winter's night has occurred, the work on the following morning is usually very heavy. At noon the sun's time of transit is taken, and at one o'clock the "ball" is dropped, by means of which the various vessels in the docks and in the Thames set their chronometers, or ascertain their rate. In addition to this, the time is sent by electricity to Deal, and one or two other seaports, in order that every vessel may be able to know the accurate time, if within sight of those places.

Not the least interesting portion of the observatory is the chronometer-room. For a very small charge, manufacturers or owners may have their chronometers rated at Greenwich, which is accomplished in the following manner:—

The chronometer is placed in the chronometer-room, and compared with the large electric clock in the room, this clock being kept in order by the stars. Each day the chronometer is examined, and thus its rate is ascertained in its then temperature. It is afterwards placed in a sort of closet warmed by gas, a condition supposed to represent the tropics, and it is there kept for a certain period, being tested each day as before. This change of temperature is found to produce very little effect on the best instruments, which, when they have passed the ordeal, are returned to the owners with their character ticketed to them. Some hundred chronometers are often placed in this room; and to compare them is a science, the "expert" by a glance discovering the difference between the two instruments, whilst a novice would require to mentally add or subtract, and thus slowly to arrive at the same results.

As soon as it becomes dark enough to see stars by the aid of a telescope, one of the staff commences his observations. These are continued during the night; and a register is kept of each star, planet, comet, or moon, which is "doctored" in the morning by the computers.

As all mortals are fallible, it is desirable to bring machinery into use where possible, and this has been managed in connection with astronomical observations. Instead of the computer registering by judgment the time of a star's transit over the various wires, he strikes a small indicator, which, completing the electric circuit, causes a pricker to fall and make a hole in a piece of paper that is attached to a slowly revolving barrel.

Each time the star passes a wire the pricker descends and leaves its mark; and the interval between these marks being measured by scale, the mean time of transit may be obtained.

There is usually a feeling of the sublime that comes over us when we reflect upon the vast unexplored regions of space, or contemplate the stellar world that shines upon us. The magnitude and grandeur of some of the planets in the solar system strike us with a feeling of awe and wonder, while we are puzzled at the mysteries attending comets, double stars, nebulae, &c. No such feelings or sentiments are allowed to enter into the constitution or mind of an observer at Greenwich. Saturn, the glorious ringed planet, with its galaxy of moons, is simply "Saturn, Right Ascension 10 hours 8 min. 12 secs., North Declination 16° 12' 2". Anything appertaining to the physical constitution, the probable cause of the ring, or the object of so grand an orb, does not come within the range of the observations at Greenwich, which are limited to bare matter-of-fact business work.

The southern portion of the observatory ground is devoted to the investigation of meteorological subjects, and is under the superintendence of Mr. Glaisher, who is now well known as an aerial voyager. It is here that an exact record is kept of the amount of rain that daily falls, of the direction and force of the wind, of the magnetic changes, of the temperature, amount of ozone, &c.—all matters which may, and probably will, lead us eventually to the discovery of some laws connected with the states of weather, and enable us to predict what may be expected from day to day. Whilst we are now able to calculate to a few seconds, and for years in advance, the instant when an eclipse may occur, and to explain the causes of the various planetary movements, yet we are in a sad state of ignorance as regards the cause of hurricanes, thunderstorms, continued rains and droughts; and thus we find that all the would-be prophets who from time to time spring up and oracularly announce a coming frost or fine weather, or the reverse, are perpetually meeting with most signal failures, which, however, does not defer future adventurers from attempting to gain a cheap temporary renown by trying their luck at a prophecy.

The perpetual accumulation of facts at Greenwich, whether these be of an astronomical nature or appertaining to the air we breathe and its subtle changes, is a proceeding that must eventually lead us on to a correct knowledge of the laws which govern these matters, and also keep us acquainted with any variations that may be occurring in the elements that surround us.

The order and quietness necessary in such calculations as those carried on at Greenwich prevent it from being a "show" establishment, and hence visitors are not admitted except on special business. Then, however, every aid and assistance are offered to the student and inquirer; the use of books and instruments is freely given, and such information supplied as the little spare time of those belonging to the establishment enables them to afford. Thus a visit to or a period of study at Greenwich Observatory will amply repay those who wish to gain the latest and most accurate information on astronomical subjects, or to practise themselves at the adjustments and use of the instruments; and to those who have not such opportunity, we offer this slight sketch.—*Chambers' Journal*.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 7d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 6½d. to 4s. 8d. (variable.)

The favourite ornament at the Russian Court is an enamelled Marguerite. Several millions were ordered of the Paris jewellers this spring by the nobility and court people. They have been worn not only by ladies, but by gentlemen also, in honour of the Princess Marguerite, of Savoy, during her visit to Russia. The story of this Marguerite is thus told:—In one of the Roman excavations a little gold antique was found and presented to the Princess Marguerite, who instantly slipped it on a black velvet, and wore it round her throat as a pendant. On this gold bell of the *Scavi* was a microscopic inscription in Greek, which said, "Save thee, O lady, from evil." Now it has become the latest novelty, and the little bell of ancient Rome has been reproduced in gold by the Paris jewellers for the court ladies of Russia.

A FRENCH patent has been obtained by Marlie for a metallic alloy not liable to oxidize. The ingredients are 10 parts of iron, 35 of nickel, 25 of brass, 20 of tin, and 10 of zinc. The resulting compound is to be plunged white hot into a mixture of 30 parts of sulphuric acid, 10 of nitric acid, 5 of muriatic acid, and 23 of water.—*Gewerbebehele*.

THE SETH THOMAS CLOCK COMPANY'S LARGE CLOCK AT THE CENTENNIAL EXPOSITION.

THE clock built by the Seth Thomas Clock Company, of Thomaston, U.S., and forwarded by them to the Centennial Exposition is calculated to run eight days with one winding, and to strike the hours and quarter hours on a very heavy bell or cluster of bells.

It is similar to that made by them for Independence Hall, Philadelphia, both having the same strike and time train. They differ in this, the Centennial Exposition clock has the necessary alterations and attachments to constitute what is called a quarter-strike, while the other for Independence Hall, strikes the hours only, on a 13,000 pound bell. The frame is of cast-iron, the two main strike wheels are forty-one inches in diameter, made of bronze, and the main time wheel is two feet in diameter. The movement is also fitted with a patent arrangement for turning on and off the gas at the proper times. The shafts are all of steel and run upon bell metal boxes.

The Dennison double three-legged gravity escapement is placed in full view, on the front of the arched or upright frame, having a one-foot escape wheel, with two feet pallets, made of bronze, as are all the wheels of the strike and time train.

The two-second zinc and steel compensation pendulum rod carries a cast-iron ball of 500 pounds, the rod and ball weighing nearly 700 pounds.

There are 1100 pieces.

This clock runs twenty-six dials; two five feet, and twenty-four three feet in diameter; the latter, having connection through an electric wire, giving the time throughout the Machinery Hall.

Our correspondent, having recently visited the manufactory of the Seth Thomas Clock Company, sends us the following interesting particulars relative thereto.

During the fifty years which the Seth Thomas Clock Company has been established, the factories have grown to be of great size. New buildings have been erected as wanted for different branches of the work, while additional wings were put on until we find three distinct groups of buildings, each about half a mile from the other, all filled with workmen and machinery for the purpose of making clocks. All the machines used in the factories are American inventions, and have grown up with, and been improved upon, as the increasing trade demanded. Many of the machines are very curious, interesting, and unique, and must be seen in operation before they can be understood. A vast amount of stock has accumulated during all these long years, and the shops are filled with the various parts of clocks waiting to be put together. In walking through the large rooms, one is at a loss to comprehend the use of all the wheels, springs, twisted and bent wires, bits of brass of all shapes and highly polished, which he sees piled up in boxes, cases, drawers, and hogsheads upon the floor and tables; but when it is remembered that a common eight-day spring movement clock contains about 234 different pieces, and that between seventy and eighty different clocks are made here, he will not wonder at the endless mass of instruments by which he is surrounded.

The first factory we enter is known as the movement shop, a building six stories high, eighty feet by forty, with a three-story wing twenty-five by thirty feet, and several other wings, one of which is sixty by forty feet. This factory is run by water power, drawing its supplies from the Naugatuck river. The first room which we enter in the process of manufacturing a clock is called the pressing room. The brass which is to be cut up into wheels is brought in here in large coils from the rolling mill. The room contains a large number of pressing machines, which stamp out the wheels and frame-work or front and back plates of the clock. A clock contains from thirteen to twenty different wheels, and for each new form and size there must be a different steel die with which to cut them out. For the cutting out of the various parts of a clock we were shown a collection of some 500 steel dies.

A clock wheel is first stamped out in a circular form; then it is "guttled," or the spaces are made between the spokes; it runs through a machine which makes it perfectly flat and level; its edge is then polished upon an emery wheel, and it is sent to a machine where the teeth are cut. Fifty or sixty of these wheels are placed together upon a steel spindle and then run under a small steel circular saw, which cuts the teeth. If there are to be twenty-four or forty-eight teeth the saw cuts the same number of slits or grooves upon the circumference of the brass wheels, and in two or three minutes the teeth are made. These wheels are again run under another machine, which rounds the edges of the teeth and finishes them up. They are then polished, dipped in acid to brighten them, and then plunged in lacquer to keep them from rusting. It is a popular delusion that the teeth of the wheels are

stamped out; on the contrary, they are cut in precisely the same manner as the teeth in an English clock.

In another room a large number of curious operations are going on, one of the strangest of which is called pinion driving. A pinion in a clock consists of a good-sized steel wire, upon which two or three brass buttons have been placed; between two of these buttons a number of small steel wires are arranged, which form in reality a small wheel with six or eight teeth. This method of making pinions is found to be much cheaper than it would be if they had to be cut from solid steel. The pinion-driving machine is fed with steel wires of the desired length, and a large number of these brass buttons, each one of which has a hole through the centre. The machine puts the wire through three of these buttons, and fastens them upon it at certain distances, the one from the other. The operation is performed with rapidity, and the pinions drop into a box below, when they are taken to another room to be finished. To be able to see all the operations which are gone through one should spend several days at the factory, as the machines are seldom in operation all at the same time. The pinion-drill for making the holes near the circumference of the brass buttons, through which the small steel wires are to be dropped, is a very delicate and mathematically exact instrument.

The manufacture of steel springs for the clocks is quite a branch of the business and occupies a good-sized brick house of itself. The spring room, as it is called, is sixty feet by twenty-five, and the tempering room is the same length, but narrower. The steel used is imported from England in coils about three inches wide, and from thirty to sixty feet long, according to its thickness. A strip of this steel is run through a slitting machine, which cuts it into strips as narrow as is required for the springs of different clocks. For a one-day clock the spring may be five-sixteenths of an inch wide, and five feet long, or three-eighths of an inch wide, and four feet long; an alarm spring may be one-third of an inch wide, and three feet long, while an eight-day clock has a spring ten feet long and eleven-sixteenths or five-eighths of an inch wide.

The coils of wide steel having been cut into narrow strips, these strips, which are from thirty to sixty feet long, are welded together at the ends until they make a strip perhaps 2500 feet long, which is wound upon a reel. The reels are sent to the tempering room, where the steel is slowly unwound, passing in its course first through a charcoal furnace between two bars of red-hot iron. It comes out of one end of the furnace like a narrow red ribbon, and passes immediately through a vat of cold oil; from this it runs through a tank of molten lead, where it receives its temper. The lead is kept all the time at a certain high temperature, there one which experience has shown to be the best for giving the steel a good temper. It is a nice and delicate job to temper steel properly, and requires a great deal of experience and care. Having been tempered, the steel is run through a set of emery wheels, which polishes the edges of the springs, while another machine polishes the surfaces. It comes out of these polishing machines bright and glistening as a Damascus sword, but is again run through the hot lead to give it a blue tint; it is then oiled and cut up into the proper lengths.

The springs having been tempered, are then sent to the coiling and winding machine for testing. This is done by forcibly winding them up very tight then letting them fly. If the temper is too high the springs will break, if too low they will not fly back. In either case they are sent back to be retempered; but if they are satisfactory they are clamped with an iron ring and sent to the finishing-room, where they are put into the clocks. Such is the process of manufacturing steel clock springs.

The finishing rooms, which are eighty by forty feet, seem to be vast workshops where no two men or women are doing the same kind of work. Long benches run the whole length of the room, at which the workmen sit, each operating some delicate and novel machine. We find one man at work upon clock keys, another upon the handles of the keys, each piece going through several operations, and passing under as many different hands. A lady is at work upon the ball screw regulators which are attached to the pendulum bob for raising or lowering it. Men are seated before lathes, and with delicate instruments are turning down the ratchet wheels, which have to be cast instead of being cut out of a sheet of brass. Five or six men are seen at work with lathes turning down pinions and finishing them up after the driving machine has put them together; another man is drilling the pinion rods; one is cleaning the castings for the ratchets; a lady is engaged upon the lock-work for the striking apparatus; a man is turning clock door knobs; another is cutting a thread inside of holes in the front and back plates for screws; eight men are engaged upon ratchets and pinions, each with a buzzing lathe; a woman is finishing up the hour hands of clocks,

of which she has about a bushel basket full by her side; a machine is making rivets with heads to them; another one cutting steel pins, and so on through room after room—an almost countless number of operations.

As there are about 234 different pieces in each ordinary clock, and as each piece goes through many hands, the number of operations must be immense, and to describe them all in anything like accurate detail would far exceed our limits of space.

Each separate wheel, pinion, spring, bit of brass, pin, rivet and screw having been finished, we go to the movement room, where the machinery of the clock is put together. This room is also forty by eighty feet, and in it we find men seated before tables covered with wheels and portions of the clock-work in large heaps. The frames for the machinery having been prepared, a man picks up the wheels, pinions, &c., puts in the spring, attaches the fly, and, buzz, the clock runs! reminding one of a huge golden butterfly as much as anything. One man can put from fifty to seventy-five clocks together in one day. As fast as the movements are completed they are put up in racks to run down—by this means the clock is tested. If it stops before the force of the spring is spent the trouble is ascertained and adjusted. All the clocks before they leave the establishment are in this manner thoroughly tested. The clatter, buzz, and motion of a field of clocks packed as thickly together as they can stand produces a good deal of commotion, and makes one almost imagine the little instruments are alive. The prices of clocks made at this establishment range from two to forty dollars, and 10,000 a month can be turned out if necessary.

USEFUL RECEIPTS FOR THE TRADE.

THE best means for producing a black surface on brass or silver is said to be platinum chloride, which is allowed to liquefy by exposure to the air. It is best rubbed in with the ball of the thumb. After blacking, the object should be washed and polished with oil.—*Jewellers' Circular*.

For preserving the lustre of silver or plated ware, when not needed for actual use for a considerable time, a coating of collodion may be employed to great advantage. The articles are to be heated and the collodion then carefully applied by means of a brush, so as to cover the surface thoroughly and uniformly. It is used conveniently when diluted with alcohol as for photographic purposes.—*Ibid*.

MELTING POINT OF GOLD ALLOYS.—The least addition of copper or silver lowers the temperature of the melting point considerably: 1 of copper to 23 of gold, or the so called 23 carat gold, melts at 2-012° Fah.; 22 carat 2-009°; 20 carat 2-002°; 18 carat 1-995°; 15 carat 1-992°; 12 carat 1-987°; 10 carat 1-982°; 8 carat 1-973°; 7 carat at 1-960°, &c. This lowering of the melting point takes place notwithstanding copper has a higher melting point than gold, namely about 2-372°. If the alloy is made with silver, all these melting points are considerably lower, while pure silver melts at 1-922°.—*Ibid*.

THE New York Druggist Circular recommends the following as a liquid polish of silver plate—3 to 4 drachms of cyanide of potassium, 8 to 10 grains of nitrate of silver, and 4 ounces of water; apply with a soft brush, wash the object thoroughly with water, dry it with a soft linen cloth, and polish with a chamois skin. Neither writing nor powder of any kind should be used for cleaning and polishing, they only waste and scratch the silver. In the case of solid silver, some English preparations are alterable in the solution.

RE-COLOURING GOLD CHAINS.—Several methods are employed, according to colour required and goodness of alloy. In all cases preliminary cleaning with aquafortis and subsequent rinsing will be necessary. For yellow gold take 6 parts saltpetre, 2 of copperas, 1 of white vitriol, and 1 of alum. Powder finely, mix, and add water previous to application. For green gold, 11-2 part of saltpetre, 11-2 sal-ammoniac, 11-4 Roman aloes, and 11-2 part of verdigris, well mixed and moistened with water for use. Red gold. sal-ammoniac, blue vitriol, alum, and borax, equal parts. Powder, mix and moisten with water. For general work use common salt, 1 part, alum 1 part, saltpetre 2 parts, the whole well powdered and mixed. To use these, place them in a plumbago crucible (not metal) with a small quantity of water. Heat until the composition begins to boil. Having suspended the work by a horsehair, place it in the crucible, and allow it to remain there, moving it about for seven minutes. Withdraw, and rinse well in a pipkin of boiling water. The colour will now be dark, nearly black; again dip and rinse, and repeat until the work acquires the desired rich tint. Finish with scratch-brush or burnisher, and dry in boxwood dust.

SILVERING OF IRON WIRE.—Dr. Hceren recommends the following plan for giving to iron wire a silvery appearance. The wire is prepared by immersion in sulphuric acid, in which a piece of zinc is suspended. The wire is then placed in contact with a plate of zinc in a solution of 2 parts tartaric acid in 100 of water, to which 3 parts soda are added. The wire remains a couple of hours in the bath, and is surfaced by polishing, or passing through a draw-plate. Spiral or any fashioned iron can be surfaced according to this plan.

MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

GREAVES THOMAS, Selly Oak, King's Norton, and 17, Caroline-street, Birmingham, jeweller. August 31.
GROOS CARL, 45, Hatton Garden, jeweller. August 28.
MORTIMER WILLIAM, Heckmondwike, watchmaker. August 28.
WINTERBOTTOM JAMES, 30, Manchester Street, Oldham, jeweller and watchmaker. August 28.
DIAMOND JOHN, Colchester, watchmaker. September 9.
GARLAND JAMES, Grey Street, Newcastle, jeweller. September 7.
ARMSTRONG WILLIAM, 43, Lord Street, Liverpool, watchmaker. September 13.
HADLEY WILLIAM, 18, Lichfield Street, Birmingham, grocer and jeweller. September 16.
HUTCHINSON JOHN JOSEPH WILLIAM, Camp-hill, Birmingham, clock manufacturer. September 15.
MORRELL GEORGE, Park Road, Soho, Birmingham, baker and jeweller. September 13.
TOPPLIS JOHN, trading as TOPPLIS & SONS, 117, Saint John Street, Clerkenwell, wholesale clock maker. September 11.
BRIGGS EDWARD HUGH JOHN, Norwich, jeweller.
FREW THOMAS & WILLIAM ELLIS, trading as T. FREW & Co., King Street, Penrith, Cumberland, jewellers. September 20.

Scotch Sequestrations.

SCOTLAND.

HUGHES JOHN, 26, Gt. Hamilton Street, Glasgow, watch and clock maker. September 11, with protection. Tr., and Com., Faculty Hall, Glasgow, September 21 at 12. Claims by January 11. Agent, James W. Knox, Glasgow, writer.

Meeting of Creditors under Sequestration.

FRASER WILLIAM, High Street, Inverness, jeweller. Thompson, Johnston, & Jackson's, 70, George-square, Glasgow, September 27 at 12. Consider trustee's discharge.

Trustees Appointed.

FULLWOOD JAMES (Liq.), Newport, Mons, watchmaker. Trustee, Richard B. Evans, 30, High Street, Newport, accountant.
ANGELL-GREEN RICHARD, (Liq.), 82, Strand, jeweller. Trustee, Thomas Brooks, 7, Saint Mark's Crescent, Camden Town accountant.

Dissolutions of Partnership.

PEACHEY & GRIMLEY, Newcastle-Place, Clerkenwell, jewellers. August 12.
SHRUBSALL & JALFON, Sherness, pawnbrokers, jewellers, auctioneers and valuers. July 14.

Discharges Granted and Bankruptcies Closed.

GRIFFITHS EBENEZER, King Street, Oldham, watchmaker. (The whole of the property has been realized.) Bankruptcy closed August 24.
PHILLIPSON WILLIAM, Richmond Row, Liverpool, watchmaker. (Div. amounting to 7/9 have been paid.) (Bankruptcy closed August 25.)

THE ASTRONOMER ROYAL'S SUPPLEMENTARY COMPENSATION AND THE GREENWICH TRIALS.—In a letter to the *Horological Journal* the Astronomer Royal requests that it should be made known to chronometer makers as widely as possible, that in the annual trial of 1877 all chronometers must be fitted with the supplementary compensation.

A VERY minute watch, specially manufactured for the purpose by the Ecole de l'Horlogerie at Besancon, has been presented to Madame MacMahon. It has a horizontal escapement, and a high magnifying power is required in order to see the hour. During the presentation the Duc d'Aumale, who was present, informed the Marshal that the Duc de Penthièvre used to wear watches in his vest buttons. His Highness ordered a set of Liliputian chronometers (?) for shirt and wrist studs, and it is anticipated that they will be ready in time for the ensuing Exhibition at Paris.

THE

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A MONTHLY TRADE JOURNAL.

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ANGLO-SAXON JEWELLERY.

IN the present article we propose to consider the state of jewellery during the time of the "Saxons."

(This is a collective name given by historians to the various Teutonic or Germanic tribes, which invaded and settled in Britain chiefly in the 5th century).

The first invasion is generally supposed to have been A.D. 449, under the command of two brothers, Hengist and Horsa, who landed in, and conquered Kent; their countrymen on the shores of the Baltic hearing of their success, followed their example; one part of Britain was seized after another, until they finally became the dominant race, founding seven Saxon kingdoms called the Heptarchy.

As these Saxons were a nation inured to piracy, it is not to be imagined that at the time they first entered this island, they could have had any arts amongst them; we certainly find mention made of a gold cup in which the beautiful Rowena drank to the health of King Vortigern, but such a vessel might have accrued to her father Hengist by the fortune of war, and therefore does not imply any skill his people had of making it themselves; besides, it may be doubted whether any author but Geoffrey of Monmouth (who is not a reliable authority) ever mentions it at all.

However, whether afterwards they learned to work in gold by their commerce with the Britons, or by any correspondence abroad, we are informed in *Thorne's Chronicle* that Ethelbert, the first Christian King of Kent presented to the monastery of St. Augustine, near Canterbury, amongst other articles a "Missuriam" or "Missorium," which it seems was a silver dish, apparently for the table (hence probably the French "mes" and our own "mess") also a "scapton" of gold, supposed to be a cup of some kind,—a "Sella" or saddle, adorned with gems, which necessarily would require a "setting," and a bridle, the bit of which was of gold, also a "speculum Argantum" or "Mirror," probably of metal, but in a silver frame.

It must be observed that Ethelbert, was fourth in direct descent from Hengist, and was the most powerful King of the Heptarchy, A.D., 570. He married a Frankish princess named Bertha, who being a Christian, stipulated that she should be allowed after her arrival in Kent, to practise her own religion; Ethelbert assented to this, and we find some years later (A.D. 596) that he was himself converted by St. Augustine, and allowed Christianity to be formally introduced among his hitherto Pagan subjects.

This intercourse with France and Rome, would naturally have a great effect upon the arts and manufactures of the Saxons.

When Gregory the Great despatched Mellitus, Paulinus, and others, to assist Augustine, they brought with them, amongst many other things, several sacred vessels, which, though made abroad, and probably at Rome, would serve as patterns for the

Saxon workmen; Augustine and his associates no doubt imported some on their first arrival, which were also useful for the same purpose, and both the sets, designed for the service of the Church, and consisting consequently of chalices, patens, basins, etc., were certainly of either gold or silver.

It appears from the venerable Bede, also from the historian Alcuin, that Oswald, King of Northumbria, A.D. 639, was served in silver at his table, on high festivals; and on one occasion, as the story tells us, being informed by his Almoner, that a multitude of poor people attended in the streets, for his alms, he ordered the food to be carried out, and the dish to be broken in pieces, and distributed amongst them.

Alcuin also mentions a silver shrine at Bamborough as containing the arms and relics of King Oswald.

Soon after this, we read that Wilfrid, Archbishop of York, was master of a great quantity of plate and jewels. "Malmesbury" reports that he was served in gold and silver, and also caused the Scriptures to be richly bound with gold and precious stones—indeed books, the sacred ones especially, had in these ages, their coverings often ornamented with gold, silver and gems;—the former were in plates, but the jewels must of course have been "set."

This Wilfrid died in A.D. 677 and Eddius speaks of him as if "inclusores gemmarum," or "enclosers of gems," (jewellers) were at that time common and ordinary artificers. Wilfrid had been often at Rome, and was otherwise a considerable traveller, so, that had artists in this particular branch been then wanting in those northern parts of Britain, he would have had various opportunities of procuring them from a distance, and we find that it was no unusual thing in those early ages, for our itinerants to import artificers from abroad. We have the case of the Abbot Benedict Biscop, (under whom Bede was educated), he frequently traversed France, and A.D. 676 brought over both masons and glass-makers to instruct his fellow countrymen; also many sacred vessels which it is presumed afterwards became models for his successor, Abbot Ceolfrid to follow.

A.D. 634 Berinus, the apostle of Wessex, came from Rome, bringing some sacred vessels with him.

A.D. 668 Archbishop Theodore entered the island from Rome, bringing, we may imagine, more holy ornaments and vessels.

A.D. 718 Wilfrid II, Archbishop of York, is spoken of by Alcuin as possessing many sacred vessels adorned with gems.

The same writer mentions Archbishops Egbert, A.D. 731, and Albert, A.D. 767, as possessing many vessels of gold and silver, set with precious stones.

When the body of St. John of Beverley, who died A.D. 721 was translated into a new shrine, about the year 1037, among other things, a ring was found in his coffin. This was a Bishop's ring, and probably a rich one.

In Mr. Drake's Eboracum there is a noble gold ring, inscribed with Runic characters, it is most likely a prelatial ornament of ancient date, but the exact age cannot be accurately determined.

At Glastonbury, in Somersetshire, the Saxons had crosses plated with gold and silver, and King Ina of Wessex, who died A.D. 727, and had been at Rome more than once, erected a chapel there called the "Silver Chapel," furnishing it most sumptuously with all kinds of sacred utensils, and ornaments. There is little doubt but that the workmanship of these vessels was equal to the materials, and excellent in the several kinds, though, perhaps, it might be exceeded by the performances of St. Dunstan afterwards, who became Abbot of Glastonbury, and was particularly eminent in the art of jewellery; in his time the monasteries were universally possessed of much treasure.

A.D. 732, Acca, Bishop of Hexham, in Northumbria, replenished his church with jewels in the most magnificent manner, the vessels of gold and silver being garnished and set with gems. Acca had been to Rome and resided there some time.

"Eddius" relates, that Offa, the great King of Mercia, who died A.D. 796, was possessed of gems to a considerable value, and that his workmen well knew how to set them to advantage. When the body of

St. Alban was discovered, he adorned the skull with a golden circlet or diadem, on which were engraved the words in Latin "This is the head of St. Alban, the first English martyr," and also caused the coffin or shrine in which the body lay, to be plated with gold and silver, and precious stones. It also appears, from the same author, that this munificent Prince had bestowed many other valuables on his newly founded church of St. Albans. Offa not only lived in close intimacy with the Emperor Charlemagne, but had spent a whole year in Rome, and A.D. 784 two Papal legates arrived and staid in England some time.

In fact, there is sufficient evidence of the advanced state of the mechanical arts in the Kingdom of Mercia at this time, in the elegance of Offa's coins, for it may be assumed generally, that, as these arts are reciprocally connected, wherever there existed a terseness and beauty in the mints, there necessarily was an equally good taste and delicacy in jewellery, drawing, engraving, casting, &c.

Wiglaf, another King of Mercia, A.D. 833 gave to the Abbey of Croyland, a gold chalice and crucifix; an alter plated with gold, and a cup, silver gilt, partly engraved, and partly embossed; also a drinking horn, which was his own royal utensil, only to be used at great festivals of the Abbey, and which was richly garnished with jewels. Therefore we have good reason for supposing that the Saxon artificers at this time, worked finely in gold and precious stones.

Egbert, A.D. 827, who put an end to the Heptarchy, making himself King of all England, was greater and more powerful than his predecessors, and to judge from the coinage was the first to wear a *radiated diadem*, a regal ornament no doubt seen by him on the Roman and Frankish coins. He is sometimes represented as wearing a diadem raised on pearls. Egbert had spent twelve years at the Court of Charlemagne, which proves that long and frequent intercourse had existed between the Saxons and Franks. And supposing him to have worn such an ensignia, it must have been made by goldsmiths. A ring supposed to belong to Alhston, Bishop of Sherborne, who lived in this reign, was found some years since by a labourer, on a common, at a place called, "Lyn's Faen," in the north east corner of Carnarvonshire; it was of solid gold, beautifully enamelled, and in excellent preservation. It weighed about an ounce, and was invaluable on account of its Saxon inscription, since, except legends on the coins, epigraphs in that language are rare. It was first thought to have belonged to Athelstan, but on examination, the inscription turned out to be "Alhstan," and is therefore attributed to the warlike Bishop of that name, who accompanied Egbert in his wars with Wales.

It is clear from this detail that in the middle of the 9th century, long before Alfred was at leisure to instruct his goldsmiths, the Saxons were well able to work in relief, or rather chase, and knew how to cut crystal or gems, so as to inscribe names on them.

The inevitable melting pot has left us few specimens of Anglo-Saxon art, but we feel there must have been many, for the business of a Goldsmith was in high repute in those days—A remarkable jewel was found in 1693 at Newton Park, a short distance north of the site of Athelney Abbey, in Somersetshire. It is now preserved in the Ashmolean museum, at Oxford; and independent of its bearing the name of "Alfred" is a most interesting specimen of Saxon art; from the circumstance of the jewel having inscribed on it in Saxon characters, "Allfred me haet gewercan" (*Alfred had me wrought*) we may reasonably conclude, that it was made under his own superintendence, and, from the richness of workmanship and material, that it was a personal ornament for the good King himself. Asser, his friend and biographer, informs us that when he had secured peace and protection to his subjects, he resolved to extend among them a knowledge of the arts. For this purpose he collected from many nations, an innumerable multitude of artificers, the most expert in their respective trades. Among these were many workers in gold and silver, who, acting under Alfred's immediate instructions, executed, with incomparable skill, many articles of these metals.

We may therefore conclude that the Saxons, gradually acquired the art of working in gold and precious stones from their intercourse with France and Rome, but that they at last were themselves capable of producing and finishing articles, with as much taste and delicacy as other nations.

PATENTS.

Application for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

3436. FREDERICK WEINTRAUD and RICHARD JAMES SECUNDUS JOYCE, of 18, Aldermanbury, in the city of London, Manufacturers, for an invention of "Improvements in solitaires or sleeve and collar studs."—Dated 31st August, 1876.
3616. WILLIAM HENRY DOUGLAS, of Stourbridge, in the county of Worcester, Jeweller, for an invention of "Improvements in studs or clasps."—Dated 15th September, 1876.
3776. JAMES THORNTON, of Birmingham, in the county of Warwick, Goldsmith and Jeweller, for an invention of "Improvements in the manufacture of wedding and other rings, and in tools and apparatus to be employed in "Hall" marking and otherwise marking the said rings."—Dated 28th September, 1876.
3785. GEORGE EDWARD PRITCHETT, of 39, Lombard Street, in the city of London, Architect, for an invention of "New or improved means, apparatus, or appliances for utilizing clocks, clock-work, or time-keeping movements, so as to put the same in communication with distant buildings, rooms, or places."—Dated 28th September, 1876.

Notices to Proceed.

3356. FRANK MOORE, of Knowle, in the county of Warwick, Tool Maker, has given notice in respect of the invention of "Improvements in solitaires, sleeve links, and other similar dress fastenings."
2185. LOUIS JOSEPH ROUCOU, of Birmingham, in the county of Warwick, has given notice in respect of the invention of "An improved liquid compound or composition for bronzing copper, brass, zinc, and other metals, and for preventing the discolouring of gold, silver, and other metals."
3366. CHARLES JACKSON, of Burton-on-Trent, in the county of Stafford, Jeweller and Silversmith, has given notice in respect of the invention of "Certain improvements in the manufacture of solitaires and studs, glove fasteners, and other like purposes."

Grants of Provisional Protection for Six Months.

3278. To JOHN MILLS, of Manchester, in the county of Lancaster, Commission Agent, for the invention of "Improvements in arrangements for illuminating clock dials and semi-opaque signs."
3356. To FRANK MOORE, of Knowle, in the county of Warwick, Tool Maker, for the invention of "Improvements in solitaires, sleeve links, and other similar dress fastenings."
3487. To EMMA ELIZABETH ASHING, of Camden Town, in the county of Middlesex, for the invention of "Improvements in solitaires, and studs and other similar dress fastenings."
3366. To CHARLES JACKSON, of Burton-on-Trent, in the county of Stafford, Jeweller and Silversmith, for the invention of "Certain improvements in the manufacture of solitaires and studs, glove fasteners, and other like purposes."
3597. To RICHARD HARRISON, of 14, Dawson Place, Bayswater, in the county of Middlesex, for the invention of "Improvements in fastenings for ladies' cuffs, partly applicable to studs generally."

Patents Sealed.

956. THOMAS WILLIAM GREAVES, Jeweller, of Birmingham, in the county of Warwick, for an invention of "Improvements in ornamenting solitaires and other articles of jewellery with pressed glass, and which said improvements are also applicable for other useful purposes."—Dated 6th March, 1876.
1091. EDWIN POWLEY ALEXANDER, of 14, Southampton Buildings, in the county of Middlesex, Consulting Engineer and Patent Agent, for an invention of "Improvements in pocket alarums or alarm watches."—A communication to him from abroad by Charles Frédéric-Dietz-Monnin, of the firm of Tapy Brothers & Company, of Paris, in the Republic of France, Manufacturers.—Dated 13th March, 1876.
1272. HENRY WALKER, of Birmingham, in the county of Warwick, Gun Manufacturer, for an invention of "Improvements in fastenings for solitaires, sleeve links, collar and other studs, gloves, bags, and other articles."—Dated 24th March, 1876.
2728. WILLIAM CHARLES SHEATON CLARK, of Action Street, Gray's Inn Road, in the county of Middlesex, for an invention of "Improvements in tell-tale clocks."—Dated 3rd July, 1876.
1529. JOHN COMPTON WEEKS JEFFERYS, of 14, Tottenham Court Road, in the county of Middlesex, Manufacturing Jeweller, for an invention of "Improvements in scarf-rings and other like dress fasteners and ornaments."—Dated 11th April, 1876.

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HOROLOGY.

(Continued.)

XVIII.—DIALLING.

HOPING that our readers have by this time fully digested our last article on declination, we will now follow it up by a kind of universal application of the circle to another portion of our subject. By referring to what has been already stated, it will be seen that an equinoctial dial is itself a circle. What we are now about to endeavour to explain is, an easy method to describe a dial on any kind of plane by means of this circle. Perhaps it may help the reader if we briefly repeat the leading points in the construction of the equinoctial, so that he may have it before him for his present purpose, in conjunction with what we are about to write, instead of turning and searching through our back numbers for several months.

First of all, then, bear in mind that an equinoctial dial is one that has the same plane as the equinoxes; and this brings us to a word or so of explanation to make clear the meaning of the term, which explanation also involves a second one, in order that it may be properly understood. We must first of all treat of equator and ecliptic in connexion with equinoctial.

Equator is from the Latin *æquo*, to make equal, and, in astronomy and geography is the great circle of the earth that divides into northern and southern hemispheres, and is equally distant from both poles; we have here, however, to deal with the term astronomically, and will at once proceed to ecliptic. The word is from the Greek *eikleiptikos*—*ekleino*—to fail—*ek*—out; *leipo*—to leave; to leave out,

to wane, or fall away. This great circle of the heavens—*linea ecliptica*—is the supposed path of the sun, and the line upon which only, eclipses can take place. Instead, however, of its being the supposed path of the sun, it is, in reality, the course among the fixed stars which the earth describes, as seen from the sun in its orbital motion from year to year. We have already mentioned the EQUATOR; the ECLIPTIC is the corresponding circle of the heavens that is of the most important value to us; it is drawn through the zodiac, and makes an angle with the equator of 23 degrees 27 minutes. This angle involves an inclination of the plane of the ecliptic to the plane of the equator, and is called the obliquity of the ecliptic; and it is the relative positions of the sun and moon upon the ecliptic that settles the number and time of the eclipses of both luminaries; hence the name of the circle, ecliptic. It is within the limits of this line that the moon gets between the sun and the earth, and eclipses the sun, and the earth gets between the sun and the moon, and eclipses the moon. To prove by demonstration to the eye what this obliquity of the ecliptic is like, let the reader try the following plan:—

Take two hoops, and place one of them in such a position that it shall represent the equator; on the outside of that place the second one in such a manner that its rim shall be elevated 23 degrees 27 minutes above the rim of the first upon one side, and below it on the other; this second is the ecliptic. Now, the points where these hoops cross each other are the equinoctial points—"D'ye see?" *æquus*, equal; *nox*, night—equal nights. That is, that when the sun is upon these points the nights are equal—literally, equal nights and equal days. Of these equinoxes there are two in the year, as we all know in another way. The first is called the vernal equinox—belonging to the spring—which occurs on the 21st of March; and the second is the autumnal equinox, belonging, as its name implies, to the autumn,

and happens on the 21st of September. These must not be confounded with the solstices—*sol*, the sun, and *sto*, to stand—when the sun stands still for a few days—or seems to do so—which makes those days of an equal length. This happens on the 21st of June, and the 22nd of December, which make our longest and shortest day. Hence the term equinox, whilst equator is derived from the fact of its being that circle of the sphere which the sun crosses in his annual journey, making those divisions. We will now resume the thread of our subject.

It has been stated—*ante*—that an equinoctial dial is the easiest and most natural of all dials, but the necessity of drawing it double prevented its being much used. We have no space at present to go into full details, as we formerly did, but we will recapitulate the leading points, and then the rest will be comparatively easy.

Take a pair of compasses, and on the proposed plane draw a circle, after which cross this circle with two diameters at right angles to each other, which will produce all the quadrants of the circle. Subdivide each quadrant into six equal parts, which will be hour-lines, but you need not mind the upper parts of the upper quadrants, as will presently be explained. What we will call the vertical diameter, from top to bottom, as the plane lies before us, will serve for our starting point. At the bottom point write the figure 12, and at each point to the left hand go on with the other figures up to that of 8. This being done proceed up the right hand side in diminishing order, thus:—12, 11, 10, &c., up to the figure 4. This will be the morning side, whilst the opposite one beyond 12, or noon, will be the afternoon side. The reason why the hours are limited to 4 in the morning, and 8 in the afternoon arises from the simple fact that the sun, even on the longest day, does not shine on any hour earlier than 4, nor on any later than 8. Finish the work by driving in a pin, or “style,” through the centre of the circle, to throw the shadow. This dial is then to be fixed in the plane of the equator, having the 12 hour-line in the plane of the meridian, with the point of the style looking towards the south. These are the leading outlines, and the proofs having been given in a previous number, need not be again repeated. Having now got our equinoctial dial, we will proceed to apply it in the construction of a dial on any kind of plane which, in dialling days, was known as the “universal mechanical dial.”

Suppose that the plane is horizontal, like a flat slab on a garden wall, or pillar, find, according to the compass bearings of the place, a meridional line. There should be no difficulty in this, as every longitude has its own noon, and a stick stuck straight up in the ground would show the length of the different shadows of the sun for several hours—say from 11 o'clock p.m., until 1 p.m. Mark the longest of them, and between that mark and the stick draw a straight line, which will be the meridional north and south. Upon the slab draw an equilateral triangle, whose side shall be equal in obliquity to the axis of the earth, which may be easily found. Next, upon these lines make a triangle of wood, slate, or metal, and raise it so that its base line shall rest on the base line of the drawn one. Having done this, take your equinoctial dial, pull out the short pin from the centre and insert a long, pointed rod in its centre, so long that one end shall rest just inside the line of the slab, and the dial towards the other end just over the point of the triangle—the “apex,” as it is technically called. This rod, or style, should project beyond the dial about one-third its entire length, and be pointed. The hour of 12 should hang over and coincide with the opposite edge of the raised triangle. What we have now to say—and this is worth noting—that this second edge of the triangle is a prolongation of the hour-line of the dial. Let us say that we have finished the job after tea, in these short days, and we want, not only to satisfy our own curiosity, but to impress the “Missus” with the power of intellect—of our intellect in particular—and where there are little ones we gather them all together in front of our work. We then light a candle and turn out the gas, and, taking the candle in our hand, we “focus” it in such a position that its light shall be a sun, and it shall make the style show the different hours as we move it along, all round the slab, thereby converting it into a supplemental dial. This universal mechanical dial is a very interesting instrument when made. After the candle amusement is done with, it may be taken out of doors and fixed in its place, according to the directions which have been given for fixing a horizontal dial. When this has been done note the points that the sun-shadow makes each hour upon the slab, and draw shadow lines, which lines will make the slab index permanent. Should a dial be required on a vertical plane, as against a wall, for instance, fix the equinoctial dial as already explained, push forward the index until the pointed end of it touches the plane. Again; supposing the plane to be inclined to the horizon, find the elevation of the pole, and make the angle of the triangle equal to it. These dials are said to be dials with centres, but there are dials without centres as well.

Dials that have no centres are those whose hour-lines converge in fact, but they do that so slowly that the centre towards which they do converge cannot be given upon the plane. For instance, there are horizontal dials without centres; they can only be made for places the pole of which is either very small or very great. And vertical dials without centres are for places where the elevation of the pole is very great.

Then there are ring-dials, which travellers have as a kind of curiosity. They are about the size of a watch, the rim of which they very much resemble, having also a bow, to which a chain or ribbon can be attached; there is an inner circle, ring form, like the outer, whilst a cross-bar joins the two. Upon the outer ring are engraved such latitudes as may be desired, with double meridians of longitude up to 90 degrees. One scale is on the quadrant of the bow, whilst the other is on the opposite quadrant. The inner ring is set into the outer one so as to be moved at right angles by two pins, pinning the edge of one to the edge of the other. This inner circle is the indicating dial, having double hours and hour-lines marked upon it. The axial pins are passed through the two rings uniting them, at the two 12 figures and the zeros of the quadrant degrees. Holding this dial as one would a watch, by the ribbon-bow, and looking at it, we find the first set of hours upon the inner dial running round from 12 consecutively, on the right-hand side to 12 at the bottom pin. The second set of figures commences here, and continues up on the left-hand side to the first 12 that we started from. The cross-bar alluded to just now is so constructed as to answer the purpose of a bridge, having the signs of the zodiac ornamentally engraved upon it. The method of using this dial is to ascertain the longitude of the place where the traveller may happen to be, from which a meridian may be deduced. Having obtained that, the dial has only to be placed in accordance with that meridian. The style is where the inner ring is pinned to the outer at the upper quadrant. Should any of our readers, who are watchmakers, wish to try their skilful fingers at making a ring-dial, we have to tell them that the rugs are *flat* on the front sides, and that the outer ring must have a straight line drawn from the centre of the pendant to the opposite. These lines will represent the 45 degrees of longitude of the upper and lower quadrants. On the upper one decrease to zero on the left, and increase to 90 degrees on the right; on the lower one decrease to zero on the right, and increase to 90 degrees on the left. The cross-bar passes through the inner ring, so that it touches the ring over on the right-hand and under on the left. We have no further directions to give.

THE GREENWICH TRIALS FOR 1877.

SIR G. B. AIRY (Astronomer Royal), referring to the above subject, sends the following letter to the *British Horological Journal*:—

“Admiralty, October 18th, 1876.

“Referring to the decision of the Lords Commissioners of the Admiralty that chronometers intended for trial at the annual competition of the year 1877 should be furnished with the Supplementary Compensation suggested by the Astronomer Royal:

“Their Lordships are informed that, in respect of the shortness of the time before the commencement of the trial, there will be some difficulty in preparing and adjusting chronometers which were not originally fitted with the Supplementary Compensation; and that, for those which are so fitted, a longer time for adjustment is desired by the makers.

“Their Lordships are therefore pleased to approve of the withdrawal of the prohibition of chronometers not furnished with the Supplementary apparatus, for the year 1877 only.

“They approve also of deferring the trial in the year 1877 by one month: the last day of receiving chronometers being Mouday, February 5th, 1877.

“It is their Lordships' intention to confine their purchases to chronometers fitted with the Supplementary Compensation.”

MR. FREDERICK BIRD, secretary of the General Cemetery, Birmingham, died on Wednesday, September 27th, in his 60th year, at his home at the Cemetery. He was a Fellow of the Royal Astronomical Society, and gave special attention to the construction of mirrors for telescopes, and in particular brought the art of polishing them to a high degree of perfection, by a process of his own invention.

NEW FURNACE FOR JEWELLERS WORK has just been introduced by Mr. Thomas Fletcher, F.C.S., of Warrington, specially designed for the purposes of jewellers. It can be used either as a crucible or muffle furnace, is without any loose internal fittings, or parts, and requires neither blast nor attention.

SIR JOHN BENNETT'S NEW CLOCK AND CHIMES, AND STRIKING FIGURES.

ALL things are ever changing" said the Latin poet, and those who are continually passing Cheapside can verify the truth of the saying. Gog and Magog have gone into country quarters, having left the dense vapours of the "City Observatory" for the balmy atmosphere of Devonshire, and new ones take their places. "All things are ever changing, nothing comes to an end;" or, as that erotic scribbler, OVID, puts it, *Omnia mutantur nihil interit*. Nothing comes to an end, and, by way of demonstrating that fact in one of its senses, we accepted the invitation to look at the new clock and chimes now being got ready to replace the old ones that have taken their departure.

And first, of the clock:—This clock rests on a frame 12 feet by 2 feet, or from hammer-tail to hammer-tail 13 feet, and by taking in the flies, 3 feet. A comparison may be arrived at when we state that the Westminster clock, "Big Ben," is 15½ feet long, by 4 feet 7 inches wide in frame. In the latter the bell-rope levers work inwards, the lines being attached between the lever-pivots and the cam-wheel, whilst in the Cheapside clock, the pivots are in the centre, and the hammer-tails overhang a few inches. The escapement is a Graham dead-beat, which, as we have said elsewhere, possesses a fascinating power over clockmakers, which no novelty seems strong enough to either disturb or modify. Its beautiful appearance, and the quietude and ease with which the tooth of the scape wheel falls on the dead face, and thence silently glides upon the impulse one of the pallet, endears it to the British clockmaker, his love for it being deep and enduring, in *secula seculorum*. The instrument under notice has a one and half-seconds' pendulum, with a cylindrical cast-iron bob, weighing 2 cwt. The pendulum rod is circular in section, of about 1¼ inches in diameter, and is made of fine white pine that has been baked in an oven and varnished. It is suspended by a spring 4 inches long, 1½ inches broad, and No. 12 gauge in thickness. The regulating nut is a 36-thread Whitworth screw, so fixed as to enable delicate adjustments to be easily made. With respect to the suspending spring of pendulums, we cannot help expressing ourselves, as we have often done before, to the effect that all our clockmakers err—if err it may be called—on the side of over-strength. It has been ascertained by experiment that the tenacity of flat springs is very great. Take our one-second English astronomical clock, with a pendulum ranging from 15 lbs. to 20 lbs. in weight. The spring of it is only 2 inches long, 0.45 broad by .006 inch thick, yet its holding power, within the breaking strain, has been estimated up to 1000 lbs. A 400 lb. pendulum can be worked with a spring 1 inch broad, and .02 of an inch thick. The Westminster pendulum spring is but 5 inches long, by 3 inches broad, and 1-60th of an inch thick, yet it carries a bob and pendulum that weigh altogether nearly 7 cwt.; the bob itself is 400 lbs. Taking the 12 gauge to be about a 90th of an inch in thickness, the spring of the pendulum of the Cheapside clock, in comparison with the Westminster one, is about three times as strong as there is any occasion for; in other words, Sir John Bennett might have had the springs of three such clocks out of the material that he has put into one. It has beat-screws for setting on beat. We dare say that he knows, and so does every other clockmaker, all that, quite as well as we do, and that in saying what we do we are only adding another name to the list of those who are "teaching your grandam," &c. Curiously enough, we saw, about this time last year, a chiming, long-case house clock being "mounted" at a place in the country, and upon glancing over it, we found that the pendulum spring was almost strong enough for the clock of a parish church. Upon pointing this out to the maker, he answered:—"Yes, we know it; we always make things about three times stronger than necessary. We go in for the solid, as if the clocks were to last for ever, and that no more clockmakers were to follow us, or would be wanted. We can't help it; strong, solid work is the nature of a first-class Englishman, and all the preaching in the world won't alter it. With regard to baked and varnished pine pendulum rods, we are glad to see them "coming in" again, and it is a great pity that they were ever departed from. Although the revival is in circular section, they were formerly not so. It is now nearly seventy years since the late Captain Kater published a description of the form of, and experiments made with, this kind of pendulum. He attached it to a sidereal clock "not of the best construction," and he had every reason to be satisfied with its performance. Of course the great object in such pendulums is to keep out moisture, and in the baking and varnishing that can be effected. The above-mentioned form took the name of the Kater pendulum.

There was one feature in the new clock under notice to which our attention was requested; this was a locking detent to prevent weather disturbance of the hands. The plan here is stated to be original, and the arbor upon which it works, is the "set" arbor. It is so constructed that the leading-off rod being in connexion with

it—the latter having a universal joint—the whole of the hands of all the dials may be either moved simultaneously or separately. This is done by the simple lifting of a spring, which we may call the locking spring and click. The stoppage of the hands by wind or snow, whilst not affecting the work of the pendulum, can be put on by an interior setting-wheel, that will re-set the hands as near as half a minute. The two snails and star lifting-piece on the centre arbor are arranged for dividing the quarters from the hour striking; thus a new rack-repeating principle holds the hours back until the quarters have struck the last blow. We must not omit to state that there is a maintaining power, and the usual inside "sets" for time. The wheel-work is singly movable, and can be taken off every arbor. The cam motion is said to be quite new in design; the improvement being that the chiming can be changed with in certain limits at a moment's notice to any chimes that may be desired, Cambridge or otherwise. The going-wheel is 18 inches in diameter, and the main pinion, turned out of a solid bar of steel, is 5½ inches in diameter. The barrels are all of wrought iron, upon steel arbors, with a jack-wheel to give ease in winding. The striking great wheel on the barrel is 2 ft. 2 inches diameter, and the two great wheels are 2 inches in thickness of metal. All the bushes can be removed at pleasure.

The new striking arrangement will be as follows:—Gog, Magog, Father Time, and Minerva—a new lady lately added to the strength of the company—will strike the quarters and play the chimes whilst the hours will be boomed forth by that well-known "star," Hercules. This gentleman is 8 feet high; and as great ingenuity has been applied in the construction of the striking arms, namely, shoulder and elbow joints, they will all be able to lift their hammers well, and take the full tones out of the bells. Not only will the new jointing give better effect to the striking parts, but the saving of power in raising the arms will be a little more than one half; the figures will be able to give a blow through a space of 18 inches, a great increase in force.

There will be eight dials, all with hour and minute hands, and having the following characteristics:—Two of them will be each 5 feet 6 inches in diameter, illuminated, and will represent the times of New York and St. Petersburg; two more will be each 3 feet 6 inches in diameter, will be of blue slate and will give Berlin and Constantinople; a third pair will be 4 feet each in diameter, and mark the hours for Dublin and Paris; the remaining two belonging to the present projection looking up and down Cheapside, will show London time. The clock train will be driven by a going weight of 35 lbs.; the quarters by 4 cwt; and the hour striking by 3 cwt. Should the clock strike wrong, it will always right itself on the following hour. It is intended, if it can possibly be managed, to have the first chimes pealed forth upon Lord Mayor's Day.

AWARDS AT THE CENTENNIAL.

THE following names appear among the list of awards made at the Philadelphia Exhibition to exhibitors from Great Britain and Ireland:—

James Poole & Co., London—chronometers and watches.

M. F. Dent, London—chronometers and watches.

Nicole, Nielsen, & Co., London—watches.

Charles Frodsham & Co., London—watches and clocks.

V. Kullberg, London—watches.

J. Sewill, London—chronometers and watches.

Thomas Mercer, London—marine chronometers.

Jeremiah Goggin, Dublin—bog oak jewellery, &c.

James Atchison, Edinburgh—Scotch pebble jewellery.

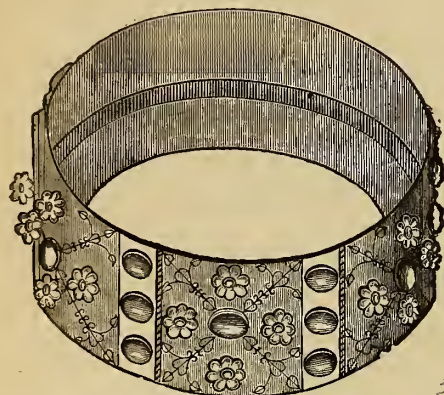
William Gibson, Belfast—jewellery.

Two prizes and two diplomas of merit have also been awarded to Mr. Charles Jeffreys, for special excellence in show cases, jewellery cases, velvet stands, &c.

GOING-BARREL UP AND DOWN WORK.—The barrel is supported by its ratchet plate only; the barrel arbor terminates in a pivot, on which turns a toothed wheel, gearing with another fixed on the top of the star wheel of an ordinary stop-work. A cock, screwed to the barrel cover, carries, concentric with the barrel arbor, a small dial with suitable divisions. The tube of the centre wheel passes through the dial, and is fitted with an indicator. As the watch goes the whole system turns, till at every full turn the star wheel is moved, and being geared with the centre wheel, the hand of the latter points to another division of the small dial. The space travelled over by the hand depends on the number of teeth in one wheel as against that in the other. The large dial of the watch must, of course be perforated, to make the small one visible. The latter, by sufficiently raising it, can be made to move in the plane of large one.

THE IRON CROWN OF LOMBARDY.

THIS celebrated crown is composed of a broad circle of gold, set with large rubies, emeralds, and sapphires, on a ground of blue and gold enamel. The jewels and embossed gold exhibit a very close resemblance to the workmanship of an enamelled gold ornament inscribed with the name of King Alfred the Great, which was found in the isle of Athelney, in Somersetshire, about the close of the seventeenth century, and is now carefully preserved in the Ashmolean Museum at Oxford. But the most important point of the iron crown, from which, indeed, it derives its name, is a narrow band of iron about three-eighths of an inch broad, and one-tenth of an inch in thickness, attached to the inner circumference of the circlet. This inner band of sacred iron, perfectly visible in the



accompanying engraving, has a remarkable legend attached to it. It is said to have been made out of one of the nails used at the crucifixion, given by the Empress Helena, the alleged discoverer of the true cross, to her son, Constantine the Great, as a miraculous protection from the dangers of the battle-field.

The statement usually given is, that the Empress, full of zeal and devotion, was bent on the discovery of the cross on which Christ was crucified. For this purpose she went to Jerusalem, and there compelled the Jews to produce and give up to her several crosses; the identity of the true one was established by a miracle, the body of a dead man was placed on each of the crosses, and when it touched the *true* one, it was immediately restored to life. The cross was then entrusted to the charge of the Bishop of Jerusalem, and soon became an object of pilgrimage, and a source of profit, for small pieces were cut from it and given to the pilgrims, who made liberal offerings. In this way the whole cross would naturally have been soon used up; but such a result was averted: it was found that the wood of the cross had the power of reproducing itself, and that however much was cut off, the substance was not diminished. On the capture of Jerusalem, in 614, it is said to have been carried into Persia, where it remained a few years, until it was recovered by the conquests of Heraclius, who carried it into Jerusalem *on his back*, in solemn procession, an event which is commemorated in the Roman Catholic Church by the festival of the exaltation of the cross on the 14th of September, commonly called Holyrood day.

When the Empress Helena discovered the cross, she also obtained possession of the four nails with which Christ's body was attached to it, the spear which pierced His side, and other articles. Of the four nails, two were placed in the Imperial Crown, one was at a later period brought by Charlemagne to France, and a fourth was thrown into the Adriatic to calm its stormy waters.

The earliest historical notice of the iron crown is, that it was used at the coronation of Agilulfus, King of Normandy, in the year 591.

On the 23rd of May, 1805, when the Emperor Napoleon I. was crowned King of Italy at Milan, he with his own hands placed the ancient iron crown of Lombardy on his head, saying, "God has given it to me, let him beware who would touch it." Thus assuming, as Sir Walter Scott observes, the haughty motto attached to the antique diadem by its early possessors.

After his coronation at Milan, the emperor instituted a new order of knighthood for Italy, entitled the "Iron Crown," on the same principles as that of the Legion of Honour for France.

THE GOLDSMITHS' COMPANY have determined to give 1000*l.* to the fund which the Chemical Society is forming for the purpose of promoting original research in chemistry.

THE BOARD OF EXCISE AND MESSRS. SMITH AND BOWLEY.—THE CHARGE OF DEALING IN PLATE WITHOUT A LICENSE.

IN our July number we gave particulars of charges preferred against Stephen Smith, of Melton Mowbray, and William Bowley, of same place, who were charged on the information of Mr. Oates, Supervisor of Excise, with dealing in plate without a proper license. It will be remembered that in both instances the summonses were dismissed, and that Mr. Oates gave notice of appeal to the Quarter Sessions. At the meeting of that court at Leicester, on the 17th ult., the case of Mr. W. Bowley came on for hearing, as an appeal from the decision of the Melton Bench, the appellants being the Excise authorities at Melton Mowbray. Mr. Bennett and Mr. Hall appeared for the appellants, and Mr. Merewether, M.P., for the defendant. The circumstances were these:—The appellant Bartlett, an officer of the Inland Revenue, visited the defendant's shop and bought a gold Albert chain, which was 20*z.* 16 dwts., for 15*l.*, whereas the defendant had only a 2 *oz.* license. Bowley made out a receipt first of all in the name of Green & Co., London, but afterwards, at Bartlett's request, he wrote out one on his own bill head, *pro* Green & Co. Defendant said if he made out a receipt in his own name the Excise would be down on him and fine him 50*l.* Bartlett had called previously and complained of the chains shown to him being too light. In cross-examination Bartlett denied that the defendant said he had got the chains on approval, but admitted that the defendant said he had to return the others he had got for the appellant to see. Mr. Bennett contended that the chain was not sold by Green & Co., but by the defendant, whom, he submitted, was liable to a penalty under the Act for defrauding the Excise, through not having a sufficient license. Mr. Merewether, on behalf of the defendant, said that there was everything to show that the chains were sold by the defendant on behalf of Green & Co. It had not been shown that the defendant had been trading on his own behalf under an insufficient license. The appeal was dismissed. Mr. Bennett applied for a case, which was refused. The case of Mr. Stephen Smith being next heard, was somewhat similar to the preceding one, the counsel being the same. In this instance the chain was purchased by Bartlett on the 18th February, from the defendant, at his shop at Melton. The chain was 18 carat gold, and weighed 2½ *oz.* Mr. Merewether said the defendant sold a chain of metal, weighing 45 dwts., of which three-fourths was gold, and one-fourth not. He read from the Statute, where the words used were, "Any person shall sell any article composed wholly or partly of gold, and the gold exceed 2 *ozs.*," &c. After deducting the amount of alloy, there was only left 33 dwts. of pure gold, which was considerably short of 2 *ozs.*, and therefore there was no offence on the part of the defendant. Appeal dismissed. Mr. Bennett asked for a case as to the interpretation of the word "gold" in the Act, which was also refused.—*Leicester Post.*

SYNCHRONIZED CLOCKS.—The long-sought desideratum of simplicity and yet efficiently controlling all the clocks on any large establishments, such as railway termini, seems at last, after many attempts, to have been obtained by a system just patented by Messrs. Barraud & Lunds, of 61, Cornhill. We expect to be able to place a full description, with drawings, in our next number.

BRITISH HOROLOGICAL INSTITUTE.—A meeting of the members to discuss the various points advanced in Mr. Cole's Essay on Isochronism, will be held at the Institute on Wednesday, the 8th inst., at 8 o'clock precisely. The first of a series of lectures to apprentices, on the different branches of the trade, will be "Watch Finishing," by Mr. Bickley. The lecture will commence at 2, on Wednesday, the 15th inst.

MORRISON'S GOLD AND SILVER SOLUTIONS.—The Judges of the Centennial Exposition have awarded a "Medal of Honour" and Diploma of Merit to Mr. A. B. Morrison, for the excellence of his Gold and Silver Solutions, an award which we think well deserved, as there can be no doubt of their efficiency and economy, a great desideratum in their favour.

CLOCK AND WATCHMAKERS' ASYLUM.—A special meeting of the members of the above institution was held on the 16th ult., for the purpose of electing one male and one female inmate. Mr. Edward East, aged 62, watch-case maker, and Mrs. Roberts, aged 61, were the successful candidates. The chair was occupied by Mr. THOMAS COLLIER, and Messrs. Spring, Wright, Pass, and Hatchman, acted as scrutineers.

A WINTER CANE has been invented in Paris for gentlemen only. It is a long, hollow tube, and, before the swell owner goes out on his promenade, it is filled with a chemical preparation which generates heat and keeps the hands warm for hours.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 53.)

THE "Annual Register" for 1764 tells us that his most Christian majesty the King of France had then lately been presented by M. Coupson, jun., a watchmaker, of Paris, with a new watch of his invention, composed of five wheels, like a common watch, but the maker substituted for the barrel, the grand spring, the chain, and the fusee, a simple spring, which alone produced the effect as did those different pieces, and without the inconvenience attending them. It required no winding up, but might be set in motion for twenty-four hours by a push, just as the striking springs of common repeating watches were wound up.

Mrs. Abington, the celebrated actress in the time of Garrick, although in receipt of a large salary, was frequently driven to the necessity of pledging her watch, which was a valuable one. The following note (the original of which is in the possession of Mr. John Bullock, of Sevenoaks, to whose kindness the author is indebted for this first public use of it) was written by her upon an occasion when she required a loan of thirty guineas, at half-past eight o'clock on the night of Saturday, November 16th, 1765:—"For Mr. Cates, next the corner of Round Court, Chandois Street.—Sir,—I beg the favour of you to send me thirty guineas by the bearer, and let me know if the grate is bought. Put the money in the box that the watch comes in, and seal it up in paper, so that the person may not know what she is come for. I am, sir, etc., F. Abington, Saturday night, half after eight."

The "Annual Register," for 1769, tells us of a curious almanac watch that was presented to George III. It was a kind of mechanical calendar, being designed merely to point out the months and days. It had a hand that was a year in making its revolution, and pointed to the month and the day of the month throughout the year. A second hand acted in the same manner as a regulator, by means of a pendulum, and was adapted to move or not at pleasure without preventing the other works from going. The sun was represented by means of a brilliant on a plate, and regularly performed its diurnal revolution. On the plate was a movable horizon to show the variations of the day, according to the seasons of the year. This watch, although of complicated mechanism, was not larger than watches then in ordinary use.

On May 4th, 1860, the Rev. J. Beck exhibited at a meeting of the Archæological Institute, a French gold watch set with jargoons. On the back is an enamelled portrait in an oval wreath of small diamonds, surmounted by a royal crown. It was made by Lepine, of Paris, and is traditionally said to have been given to Madame du Barre by Louis XV. about 1770, and was latterly in the possession of Sidney, Lady Morgan. Mr. H. Munster has another gold watch by Lepine, it has a blue enamelled back, with male and female figures, diamond borders, and the motto "Souvenir d'Amié." A white enamelled dial shows the hours, minutes, seconds, and the days of the week, and month.

About the year 1770 it became the fashion among the dandies of that day to wear two watches, the chains and seals of which dangled on each side beneath their embroidered waist-coats. The supplement to the *Universal Magazine* for 1777, gives us the following "Receipt to make a Modern Fop," in which two watches will be found named as part of the ingredients:—

"Two tuns of pride and impudence,
One scruple next of modesty and sense,
Two grains of truth;—of falsehood, and deceit,
And insincerity, an hundredweight!
Infuse into the skull, of flashy wit
And empty nonsense, quantum sufficit.
To make the composition quite complete,
Throw in the appearance of a grand estate,—
A lofty cane—a sword with silver hilt,
A ring—two watches, and a snuff-box gilt,
A gay effeminate embroidered vest.
With suitable attire—Probatum est."

An anecdote is told of an Earl of Bridgewater, that he being near Windsor, was stopped by a footpad, who after robbing him of one watch, demanded the other. "Why, do you suppose I have another?" asked his lordship. To which the thief replied, "I know it, for I observed you cross your hand to your left fob when you gave me this."

The foppery of wearing two watches was soon approved and adopted by the ladies; but it was found to be too expensive a

fashion to wear two real watches, and accordingly a true watch was worn on the left side, and a sham one on the right side of the person. The latter was called a *fausse montre*, or a dummy watch. The false watches were in some instances of gold and silver, and sometimes enriched with jewels, and enamelled miniatures at the back. Some had in front a dial plate, others a pin-cushion, and the most expensive ones had stars and devices set with stones, which were made to revolve by means of eternal wheelwork. Those persons who did not go to the expense of such costly articles, contented themselves with a dummy of gilt metal, or coloured foil. At a meeting of the British Archæological Association, held on April 22nd, 1857, Mr. G. R. Corner, exhibited an example of a *fausse montre*; one side of which was of silver thread and silk, and the other of golden coloured fabric, and as both sides were of the same convex form, either might be worn outwards. It was $1\frac{1}{2}$ in diameter, and $1\frac{1}{4}$ of an inch thick, and round the edge was sewn a chain made of the same materials as the rest, which was elongated into a loop at the top, and by which the ornament could be suspended from the girdle. When resting on the person of a well-dressed lady, this *pseudo* time-keeper could scarcely have been distinguishable from a real watch. A *fausse montre* of rich cloth decked the side of a belle at a Court festival of George III., about the year 1770. It was made of a piece of the state costume of Lady Chapman, the wife of Sir John Chapman, who filled the office of Lord Mayor in the year 1689. The material was cloth of gold, brocaded with rose-buds of green and crimson velvet, and surrounded by a pendant from a chainwork of golden cord. At the present day, a Chinese gentleman wears a pair of watches of European manufacture, one on each side of his girdle, in an embroidered pocket. If questioned as to the meaning of his seeming extravagance, his answer may be to this effect, "*Suppose one make stop, the other walkee.*"

Very advantageous exchanges of watches are sometimes made by Europeans with the Chinese, many of whom ignorantly suppose that when a watch stops it is *dead*, and are glad to barter it away for a living one. This notion of a dead watch appears to have obtained currency in most barbarian countries. Baker, in his work on the "Albert N'Yanza," (the great basin of the Nile), tells us that during his travels (commenced in 1861), a native, named Ram-rasi, produced a large silver chronometer that he had received from Speke. "It was *dead*," he said, "and he wished me to repair it." This I declared to be impossible. He then confessed to having explained its construction, and the cause of the "ticking" to his people, by the aid of a needle, and that it had never ticked since that occasion.

The Sieur Ranzonet, a watchmaker of Nancy, made in the year 1770, a watch of the common pocket size, in which he fixed an instrument of his own invention, that played an air *en duo*. All the parts of this little musical mechanism were distributed with such art as not in the least to effect the movement of the watch. It was also so nicely constructed as not to be influenced by either heat, cold, draught, or moisture.

During the reign of Catharine II. of Russia, an ingenious Russian peasant named Kulubin constructed a musical repeating watch to perform a single chant. The machine was about the size of an egg, within which was a representation of the tomb of Christ, with the Roman sentinels on watch. On pressing a spring, the stone would be rolled from the tomb, the sentinels fall down, the angels appear, the holy women enter the sepulchre, and the same chant which is sung in the Greek Church on Easter-eve be accurately performed.

The celebrated Dr. Hawkesworth, who died in 1775, was brought up to the business of a watchmaker.

It is related that when Somerset House in the Strand was being built in 1776, a workman fell from the scaffolding, but was checked in his descent by his watch-chain catching to a projecting part of the wall or scaffolding, and to commemorate his wonderful escape he placed his watch in the face of the wall. A watch face is to be seen on the south side of the quadrangle over the entrance to the old stamps and sales office; it was, however, fixed there during the first quarter of the present century, as a meridian mark for a transit instrument, in a window of the Royal Society's ante-room, in the inner side of the north front of Somerset House.

About 1776 was found in Ketteringfield, Northamptonshire, a curious watch, which, early in the present century, was in the possession of Mr. W. Woolston, of Adderbury. It was oval in shape; the case, which was silver gilt, being formed in an undulating manner, similar to the rose on the old nobles; on the face was a small circular silver dial-plate, ornamented with a landscape; and on the inner plate was inscribed "Chris de Welke."

To be Continued.

GOLD.

WE purpose giving a series of articles on the history and production of gold and other metals, with their various uses and employments in the arts and manufactures.

Gold is the most precious and easily worked of metals, it is also the most imperishable, and, with the exception of iron, is more generally distributed over the earth's surface than any other; but in many instances it occurs in such small quantities as either to escape notice or not to be worth the pains of extraction.

The search after gold has been, until recently, one of the most precarious of human pursuits, its discovery often involving the ruin of the individual, either through the large outlay necessary in the commencement of mining operations, or in the careless and extravagant habits formed by the prospect or acquisition of sudden wealth.

The fact of gold being found in its simple metallic state, combined with its beautiful colour and many valuable properties, would cause it very early to attract the attention of man, and accordingly, we find it was used by the Hebrews, Egyptians, and other ancient nations, for much the same purposes as at the present day.

The earliest mention made of its *existence* is in Genesis, chap. ii., in the description of Paradise—"And a river went out of Eden to water the garden; and from thence it was parted, and became into four heads. The name of the first is Pison, that is it which compasseth the whole land of Havilah, where there is gold; and the gold of that land is good."

That it must have been worked at a very early date there is little doubt, for in chapter xiii. we find Abraham is described, upon leaving Egypt, "as being very rich in silver and in gold." Constant mention is also made of *money*, which infers a coinage and working of the precious metals. The ladies of that age seem also to have had much the same taste for ornamentation and jewellery as at present, for we find that when Abraham sent his servant to find a wife for his son Isaac, the man is said "to have brought forth jewels of silver and jewels of gold, which he gave to Rebekah;" also "a golden earring of half a shekel weight, and two bracelets for her hands of ten shekels weight of gold." Further on, we find, that upon the Israelites leaving Egypt, "they borrowed of the Egyptians, jewels of silver and jewels of gold" (concerning which, by the bye, we find no mention of return.)

This metal must, therefore, have been plentiful at that time, and, by the description given of the Tabernacle, the Hebrews must have been very skilful artificers. The instructions received by Moses are most interesting, and give us a good idea of the workmanship and skill of those olden times. This early use of gold is confirmed by Herodotus and many other historians, as also by the many specimens of ancient workmanship handed down to us.

Massive ornaments of gold were probably in vogue, for the Israelites must have possessed a large supply when they cast the golden calf, and the gold overlaying the Ark has been computed at 156,118*l.* probably obtained from no other source than the spoil of the Egyptians. The drawings of Ramesis II., from Beitoually, in Nubia, represent him wearing bracelets and armlets, formed of plates of gold about three inches long, and one inch wide, strung on a blue web. Homer refers the manufacture of a prize cup of incomparable elegance to the Sidonians. The ladies of Athens wore golden grasshoppers in their hair, to denote their being, as those insects were fabled to be, born from the ground. Going back to biblical times, we find that "the weight of gold that came to Solomon in one year was six hundred and threescore and six talents of gold, besides that which chapmen and merchants brought. And all the kings of Arabia brought gold and silver to Solomon;" the sum named being equal to 3,646,350*l.* The Queen of Sheba, brought with her from her own kingdom "one hundred and twenty talents of gold," equal to 657,000*l.*

When Haman, the favourite of the Persian king Ahasuerus, proposed his plan for destroying the Jews, thinking it might be objected to from the effects it was likely to have upon the national exchequer, he proposed to pay into the king's treasuries, a sum equal to 3,000,000*l.* Gold was very abundant among the Persians at that time. Herodotus relates that when Xerxes went into Greece, Pythius, the Lydian, had 4,000,000 of gold darics which is estimated at 5,500,000*l.*

In Kitto's Cyclopædia of "Biblical Literature," we find the following, in reference to the temple of Belus, quoted from Herodotus:—"And there belongs to the temple in Babylon, another shrine lower down, where there stands a large golden image of the god, and near it is placed a large golden table, and the pedestal and throne are gold; and as the Chaldeans say, these things were made for eight hundred talents of gold, and out of the shrine is a golden altar. And there is another great altar where sheep offerings are sacrificed,

for it was not permitted to sacrifice upon the golden altar, except sucklings only; but upon the greater altar, the Chaldeans offer every year a thousand talents worth of frankincense, at the time when they celebrate the festival of the god. And there was at that time a statue of twelve cubits of solid gold. Darius Hystaspes wished to have this statue, but did not dare to take it; but Xerxes, his son took it, and slew the priest who forbade him to move the statue. Thus is the sacred place adorned, and there are also in it many private offerings, made by individuals, consisting of statues, censers, cups, and sacred vessels of massy gold, constituting a property of immense value. On the top, Semiramis placed three golden statues of Jupiter, Juno and Rhea. The first was forty feet high, and weighed one thousand talents. The statue of Rhea was of the same weight; the goddess was seated on a golden throne, with lions at each knee, and a serpent of silver. The statue of Juno, was erect, like that of Jupiter, weighing 800 talents; she grasped a serpent by the head with her right hand, and held in her left a sceptre enriched with gems. A table of beaten gold was common to these three divinities, weighing 500 talents. On the table were two goblets of thirty talents, and two censers of 500 talents each, and three vases of prodigious magnitude. The total value of the precious articles contained in this proud achievement of idolatry, has been computed to exceed 120,000,000 sterling." The amount of gold and silver taken by Cyrus when he conquered Asia, according to Pliny's account, was 126,224,000*l.* of our money.

Having thus given a brief outline of its antiquity, we will now proceed to describe the metal itself, its uses, properties, and where usually found.

Gold is distinguished by its splendid yellow colour and high metallic lustre. It is nearly as soft as lead, and is the most malleable of all metals. It can be beaten into leaves of a thinness not exceeding one-two hundred thousandth part of an inch, one grain may thus be distributed over 56 square inches of surface, and its ductility is so great that the same quantity may be drawn out into 500 feet of wire. Gold fuses at about 216°*C.*, becoming of a bluish green colour. It is insoluble in any acid menstruum, except the mixture of muriatic and nitric acids called *aqua regia* (which derives its name from the ancient alchemists having considered gold as the king of metals), or in solutions of chlorine. Gold has very little affinity for oxygen, and, therefore, does not rust or undergo any change on exposure to the atmosphere; it is also one of the most perfect conductors of heat and electricity. Its specific gravity is less than that of platinum, ranging from 19.2 to 19.4, according as it is fused or hammered.

There are several "alloys" or combinations of gold, those with copper and mercury being the most important. The colour of gold is not materially affected by being combined with copper, except that it is somewhat of a redder tinge. The density of the compound is less than that of pure gold, but the hardness is greater, and it is more fusible. The alloy employed in our gold coinage is composed of 11 parts of gold to 1 of copper, without which the coin would not be sufficiently hard to stand the wear to which it is exposed. Hence British standard gold contains 8.33 per cent. of copper—in France and America standard gold contains 10 per cent. of the baser metal.

The uses to which gold is now put, even in every day transactions, are more numerous probably than the majority of workmen who are constantly manipulating in the art, and through whose hands it regularly passes in the different stages of manufacture, contemplate. Suffice it to say, that almost every article both in business enterprise and domestic life, is beautified and enriched by studious and skilful artisans with traces of gold. Even the paper upon our walls, our china, our tea-trays, our book-edges and covers, our sign-boards, our sewing machines, and wares of pottery, in fact, almost every article and trinket of the household is decorated more or less with gold. We have also printing in letters of gold, gold lace and by no means least, our best pictures are all embellished with gold, and although the metals thus described may appear to the uninitiated as very extensive and costly, it would not indeed, if recovered from a whole host of such articles and trinkets, amount to more than two-penny weights, if meted, of the value of 8*s.* 6*d.* We have deemed it desirable to supply this information, which may, perhaps, be considered beside the chief part of our subject, the uses of gold and its connection with the jewellery trade, and the currency—money—to show the wide spread usefulness of the precious metal, and the very extreme of malleability to which it is reduced in order that it may be applied to so vast a circle of uses for purposes of ornamentation, and that at comparatively reasonable cost.

Pure gold is at the head of metals for ductility, it is supposed that wire drawers have extended out of an ounce of gold, a thread 230,800 feet long. The inlaid vessels and work in gold filigree from

India are examples of the greatest ductility and admirable mechanical qualities of this noble metal. In India the greatest perfection seems to have been obtained in the art of drawing gold wire, as witness, the gold embroidered housings of the elephant and howdah, as exhibited by Her Majesty in Hyde Park, 1851. But then it must be understood that the majority of filigree wire is not all similar to the real filigree of London and Birmingham; the Indian wire being thicker round wire, screwed, and then flattened, and afterwards so placed upon the different designs for the filigree of the edge to show itself, whilst the London and Birmingham filigree is wire considerably thinner, doubled and twisted into a fine cord of great delicacy. The extreme of ductility is never practised in England, there being no advantage gained in the commercial world, the finest wire required for manufacturing purposes being either for the purpose of filigree or gold lace. The latter is drawn very fine, and afterwards flattened between a pair of steel rollers any size as desired, so as to suit the object in view. There is reason to believe that the ancient Egyptians had some knowledge of the ductility of this metal, and the art of making round wire was known to them. Exodus xxxix. 3, "And they did beat the gold into thin plates, and cut it into wires, to work it in the blue, and in the purple, and in the scarlet, and in the fine linen with cunning work."

Pure gold is used only for certain chemical processes and beaten into leaf for gilding. The Staffordshire potteries consume for this purpose alone 60,000l. worth annually; all other gold, whether used for jewellery, or for coinage, is always alloyed with copper or silver to produce the requisite degree of hardness, for hammering, &c.

Jewellers alloy their gold with other metals, partly for economy, and partly to evolve special tints. The usual combinations for this purpose are as follows:—*red* gold contains 75 parts of fine gold, with 25 of copper; *green* gold combines 75 parts of fine gold with 25 of silver; *dead leaf* gold consists of 70 parts of fine gold with 30 of silver; *water green* gold contains 60 parts of fine gold with 40 of silver; and *blue* gold has 75 parts of fine gold to 25 of iron.

These alloys are generally considered as consisting of so many carats to the unit, the pound or half-pound being divided into 24 carats, each of which contains 12 grains. What we call 18 carat gold is a unit of 24 carats of alloy, containing 18 carats of fine gold, and 6 of silver or copper.

The following table gives the relative values of the different carats, and the proportion of alloy to be added, taking 24 as the unit of fine gold:—

Qualities of Gold.	£	s.	d.	Alloys to be added.
24 carats ..	1	5	0	 none
23 " ..	4	1	5½	 1 carat
22 " ..	3	17	11	 2 "
21 " ..	3	14	4½	 3 "
20 " ..	3	10	10	 4 "
19 " ..	3	7	3½	 5 "
18 " ..	3	3	9	 6 "
17 " ..	3	0	2½	 7 "
16 " ..	2	16	8	 8 "
15 " ..	2	13	1½	 9 "
14 " ..	2	9	7	 10 "
13 " ..	2	6	0½	 11 "
12 " ..	2	2	6	 12 "
11 " ..	1	18	11½	 13 "
10 " ..	1	15	5	 14 "
9 " ..	1	11	10½	 15 "
8 " ..	1	8	4	 16 "
7 " ..	1	4	9½	 17 "
6 " ..	1	1	3	 18 "
5 " ..	0	17	8½	 19 "
4 " ..	0	14	2	 20 "
3 " ..	0	10	7½	 21 "
2 " ..	0	7	1	 22 "
1 " ..	0	3	6½	 23 "

In most countries there are certain legally fixed standards for gold jewellery. In England 15, 18, and 22 carat gold is stamped, or *hall-marked*; in France 18, 20, and 22; in Germany 8, 14, and 18 carat, and also under the term of "Joujou" gold, a 6 carat used for jewellery to be electro-gilt.

Twenty carat gold does not occupy a very prominent position in the jeweller's workshop, the demand for it being so limited that it

is rarely ever asked for. In consequence, it is not largely manufactured into articles of jewellery. Sometimes, however, this quality of gold is used by coloured gold-workers, when different colours or shades are required in decorative designs, and when these colours cannot be produced in inferior gold. For this purpose it is very tasty and showy. Thus brown gold may be made by taking 20 parts of fine gold and 4 parts of copper; pure gold may be made by taking 20 parts of fine gold and 4 parts of silver; these ingredients must be well incorporated. In Ireland 20 carat gold is a legal standard, and has been so from the year 1784, reign of George III.; this standard was established, principally, to encourage the manufacture of watch cases and jewellery, at that time it being illegal to manufacture wares of jewellery inferior to 22 carat gold.

Eighteen carat gold is the second English standard, and of this quality all our best jewellery is made. It is largely manufactured into all kinds of personal ornaments; being an alloy rich in quality, the beauty of its colour is not much altered by wear. In England this standard is used for the manufacture of watch cases, which, if of proper fineness, bears the Government hall marks. There is now no duty on the manufacture of watch cases of any quality. Mourning and wedding rings, if of 18 carat gold, or of the higher standard which we have already referred to, must pay duty upon the manufacture of 17s. per ounce, one-sixth part, as usual, being remitted for waste in finishing. It is compulsory that these articles be hall-marked and bear the stamp of the properly authorized authorities of the town in which they are made. In Birmingham the title of the company is, "The Guardians of the Standard of Wrought Plate," which has exclusive jurisdiction over all gold made into the above articles in the town of Birmingham, or within thirty miles of it.

Fifteen carat gold is another alloy largely used in the manufacture of coloured gold jewellery. This quality, to our mind, is second to none regarding works of art in jewellery, both in taste, show, and durability. It can be made to present an appearance quite equal to the finest gold, and in addition is easy of manipulation; almost any article can be freely worked out of it, while the hardness which 9 parts of alloy imparts is such as not to prove a hindrance or a difficulty in the manufacture, but unites with it that amount of strength and durability so essential in costly articles of jewellery; these advantages make articles of this gold wear much better than when made of softer material; and they also keep their form and shape a considerable time longer. According to the provisions of the Act of 1854, 15 carat gold can be assay marked as a guarantee of proper fineness, but it is not compulsory, unless requested by the purchaser. There is no duty on its manufacture, neither is there on the manufacture of 18 carat gold into chains, studs, lockets, charms, fancy things, &c.

Thirteen carat gold is called common when speaking of coloured golds, for the reason that it is about the lowest quality that can conveniently be coloured to look rich and beautiful. A slightly inferior quality (12½ carats) can be coloured, but this is about the usual thing employed in all respectable coloured gold houses. In Birmingham a very large quantity of gold is weekly consumed in manufactures of this quality. Some firms manufacture nothing else. It is largely made into chains, lockets, pins, studs, sleeve-links, solitaires, pendants, bracelets, brooches, rings, filigree ornamentation, and almost every article we can mention has it in some part of its composition.

Twelve carat gold is the best of the bright golds, and so called to distinguish it from coloured, although any of the qualities which are described in speaking of coloured gold, may be made bright by a little variation in the mixture of alloy.

Ten carat gold sustains all the characteristics of the former quality, both as regards the freedom of manufacture and finish; there are no hall marks for this quality of gold, and it is very seldom manufactured fully up to the quality unless especially asked for.

Among the coined gold of European States the term "carat" is almost everywhere replaced by the term "fine" per mille. The Austrian ducats are of exceptionally fine gold—23 carats 9 grains of gold. The Dutch or Holland ducats are 23 carats 6 grains gold. Neither of these coins are at present a legal tender in Austria or Holland, but they are continually made at the Utrecht mint, having been for many years the circulating medium in the North Baltic and White Sea ports, as well as in the Black Sea and Levant. Originally they were coins of the Holy Roman Empire.

The chief gold-yielding countries are Africa, Hungary, the Oural, Australia, and America, especially Mexico, Peru, the Brazils, California, Columbia, and Victoria.

(To be continued.)

SHELL CAMEOS.

From the *Jeweller's Circular*.

SHELL is the protective covering of a class of animals widely distributed throughout the earth, the fresh waters and the ocean. This covering is in most cases exterior and large enough to enclose the whole body; but in some cases it is interior, and only of sufficient size to cover the heart and lungs. Shell is a secretion from the skin which covers the back of the animal, which is of a peculiar thickness and fleshy consistence, and is called the mantle. Shells are called univalve or bivalve, according as they consist of one part, or of two parts joined together by a hinge. Bivalves are inferior in the scale of existence to univalves, both as to power of motion and organs of sense.

Most of the univalve shells are of the character called porcelaneous, from their brittleness, translucence, and the resemblance of their fracture to that of porcelain. But this fracture, when examined by a microscope, reveals a structure of thick parallel layers, usually of a fine fibrous nature, at right angles to the external surface. The soluble part of these shells is carbonate of lime, the particles of which are cemented together with a very minute proportion of animal mucus. The hard and compact nature of such shells, and their generally smooth surface, prevent their being cut by the ordinary tools, which are available for the less hard and frangible nacreous shells; it is therefore necessary to treat them with emery, rottenstone, and other substances harder than themselves.

Such shells generally require rather to be polished than cut, but where it is necessary to divide them in order to exhibit their sections, they are operated upon by means of the slicer with diamond powder.

Certain descriptions of these shells are well adapted for cameo cutting, on account of their substance being made up of differently coloured layers, and also on account of a difference of hardness and texture in the various layers, some approaching more nearly to the nature of nacreous than of porcelaneous material.

Several varieties of the gems Strombus, or couch, supply suitable shells for cameo cutting. The outer layer is nearly colourless, can be operated upon with steel tools, and may be carved into smooth and finished forms. Experience has taught the cameo cutter to choose the kinds known as the Bull's Mouth, the Black Helmet, the Hornet Helmet, and the Queen Couch, of which the first two are the best. The art of cameo cutting was confined to Rome for upwards of forty years, and to Italy until the last twenty-six years, at which time an Italian began cutting cameos in Paris, and now over 300 persons are employed in the trade in that city.

About thirty years ago, the total annual number of shells used in the trade was about 400; the whole of them were sent from England, and they were worth 1*l.* 10*s.* each in Rome. But so rapid was the progress of the manufacture when it became more widely diffused, that the following estimate was made a few years ago as to the consumption of shells in France alone for that purpose, viz., 100,500 shells, worth 8960*l.*

The average value of the large cameos made in Paris, as stated by the authority of Gray, is 6 francs each, giving a sterling value of 32,000*l.*, and the value of the small cameos is about 8,000*l.*, while at the same time in England, not more than a dozen were employed at the trade. The Black Helmet, on account of the advantageous contrast of colour in the layers, produces very effective cameos, the carved figure of the white upper layer being strongly relieved by the dark, almost black ground supplied by the second layer. The shell is first cut into pieces the size of the required cameos, by means of diamond dust and the slitting mill, or by a blade of steel fed with emery and water.

It is then carefully shaped into a square, oval or other shape on the grindstone, and the edges finished with oil stone. It is next cemented to a block of wood, which serves as a handle to be grasped by the artist while tracing out with a pencil the figure to be cut on the shell.

The pencil mark is followed by a sharp point, which scratches the desired outline, and this again by delicate tools of steel wire flattened at the end and hardened, and by files and gravers, for the removal of the superfluous portions of the white enamel. A common darning needle fixed in a wooden handle forms a useful tool in this very minute and delicate species of carving. The careful manipulation necessary in this work can only be acquired by experience; the general shape must first be wrought, care being taken to leave every projection rather in excess to be gradually reduced as the details and finish of the work are approached. To render the high parts more distinct during the process of carving they are slightly marked in black.

Throughout the cutting great caution must be observed, that in removing the white thickness the dark ground is not damaged, as the natural surface of the dark layer is far superior to any that can be given artificially; indeed, should the ground be broke up at one part, it would be requisite to remove the entire scale or lamina from the whole surface, a process that will be found very tedious, and much more difficult than separating the white from the black. In order that the finished cameo may possess a distinct outline at all points of view, it is desirable to adopt the system followed in antique cameos; namely, to leave all the edges of the figure quite square from the ground, and not gradually rounded down to the dark surface; should this latter method be followed, it will be found that the outline is in many places undefined, owing to the colour of the white raised figure of the cameo gradually emerging into that of the dark ground; this evil is entirely avoided by leaving the edge of the figure quite square for the thickness of one-fiftieth of an inch.

The surface of the cameo should be finished as nearly as possible with the cutting tools, as all polishing with abrasive powders is liable to remove the sharp edges of the figures, and deteriorate the cameo by leaving the form undefined. When, however, the work has been finished as smooth as possible with cutting tools, the final polish may be given by a little putty-powder used dry, upon a moderately stiff brush, applied with care, and rather to the dark ground than to the carved surface; this is the concluding process, after which the cameo is ready for removing from the block prior to mounting.

The various styles in which they are mounted depends a great deal upon the country where they are to be worn. Here the public taste seems to select either pearls or antique gold settings, while now and then we meet some exquisite classical design surrounded by precious stones.

DISCOVERY OF ROMAN COINS.

THE *Times* gives the following account of the recent finding of of Roman coins on the estate of Mr. John Clayton, at Corraborough:—"Mr. Clayton has extensive properties upon and adjacent to the Roman wall. He, as lord of the manor, has made many discoveries of interest during the past quarter of a century. Mr. Clayton has recently had workmen exploring land upon the farm at Corraborough, 4 miles west of Chatterford, on the North Tyne. They have come upon a treasure chamber containing many altars and thousands of Roman coins. It appears to be the greatest find of Roman treasure which has occurred in the north of England for some time. A military chest seems to have been dropped into a bath as soldiers had retreated from the Roman station of Procolitea before the enemy, and there it has been marvellously preserved until dug out the other day. Mr. Clayton will lay the particulars of his great find before the Newcastle Antiquarian Society at its first winter's meeting. The *Derbyshire Times* reports an interesting antiquarian discovery just made on the eastern border of that county. For some time back workmen have been employed by Messrs. W. and S. Burkitt, the eminent maltsters of Chesterfield and King's Lynn, in laying down water pipes from Scarcliffe to their large new malt-houses at Langwith on the borders of Derbyshire and Notts. In digging the necessary trench, one of the workmen laid bare a large earthenware vase of Roman workmanship, buried about 2 feet below the surface. Before he could be prevented, the man unfortunately broke it open, and it was found to be nearly full of copper coins—probably 200 or 300 in number. Many of them are in tolerably good preservation, and the majority are coins of the reigns of Tetricus, Victorinus, Claudius, Gallienus, judging by a sample of about fifty submitted to the inspection of the editor of our *Derbyshire contemporary*. The fragments of the vase have been preserved.

NEW CLOCK AND CARRILLONS.—The well-known firm of Messrs. Gillett & Bland, of the Steam Clock Factory, Croydon, have just completed and fixed the new clock and carrillons in the tower of St. Mark's Church, Glodwick, in a very satisfactory manner. Messrs. Gillett & Bland are also making the great clock to strike upon a bell of seven tons, and a patent carrillon machine to play thirty-one tunes on twenty-one bells, for the Town Hall, Manchester, which we believe will be the largest work of the kind in this country.

TO EXTRACT SILVER FROM WASTE PRODUCTS.—Mix your refuse with an equal quantity of wood charcoal, place in a crucible and submit to a bright red heat, and in a short time a silver button will be found at the bottom. Carbonate of soda is another good flux.

THE HASTINGS DIAMOND.

(From the "Book of Days.")

AT a levée held on the 14th of June, 1786, a very valuable diamond, of unusual size and brilliancy, was presented to George III., ostensibly as a gift from the Nizam or native ruler of the Deccan. At the period when this magnificent peace-offering was given to the king the impeachment of Warren Hastings was advancing in Parliament, and it was very generally said, even publicly in the House of Commons, that this, with several other diamonds, was the purchase-money of Hastings' acquittal. Caricatures on the subject appeared in the windows of the print shops. One represented Hastings wheeling the King to market in a barrow, and saying, "What a man buys he may sell again." In another, the king was exhibited in a kneeling posture, with his mouth wide open, and Hastings throwing diamonds into it. An Italian juggler, then in London, pretending to eat paving-stones, had placarded the walls with bills, describing himself as "The Great Stone-eater." The caricaturists, improving upon the hint, represented the king in the character of "The Greatest Stone-eater," and the following ballad was sung about the streets, to the infinite amusement of the populace:—

A Full and True Account of the Wonderful Diamond presented to the King's Majesty, by Warren Hastings, Esq., on Wednesday, the 14th of June, 1786.

"I'll sing you a song of a diamond so fine,
That soon in the crown of our monarch will shine,
Of its size and its value the whole country rings,
By Hastings bestowed on the best of all kings.
Derry down, etc.

"From India this jewel was lately brought o'er,
Though sunk in the sea it was found on the shore,
And just in the nick to St. James's it got,
Carried in a bag by the great Major Scott.
Derry down, etc.

"Lord Sydney stepped forth when the tidings were known—
It's his office to carry such news to the throne—
Though quite out of breath, to the closet he ran,
And stammered with joy as his tale he began.
Derry down, etc.

"Here's a jewel, my liege, there's none such in the land,
Major Scott, with three bows, put it into my hand;
And he swore, when he gave it, the wise ones were bit,
For it never was shown to Dundas, or to Pitt.
Derry down, etc.

"For Dundas, cried our sovereign, unpolished and rough,
'Give him a Scotch pebble, it's more than enough;
And jewels to Pitt, Hastings justly refuses,
For he has already more gifts than he uses.'
Derry down, etc.

"But run, Jenkyn, run!' adds the king in delight,
'Bring the queen and the princesses here for a sight;
They never would pardon the negligence shown,
If we kept from their knowledge so glorious a stone.'
Derry down, etc.

"But guard the door, Jenkyn, no credit we'll win
If the prince in a frolic should chance to step in;
The boy to such secrets of State we'll not call,
Let him wait till he gets our crown, income, and all.'
Derry down, etc.

"In the princesses run, and surprised, cry, 'O la!
'Tis as big as the egg of a pigeon, papa!
'And a pigeon of plumage worth plucking is he,'
Replies our good monarch, 'who sent it to me.'
Derry down, etc.

'Madam Schwellenbergh peeped through the door at a chiuk.
And tipped on the diamond a sly German wink;
As much as to say, 'Can he ever be so cruel
To him who has sent us so glorious a jewel?'
Derry down, etc.

"Now God save the queen, while the people I teach
How the king may grow rich, while the Commons impeach;
Let nabobs go plunder and rob as they will,
And throw in their diamonds as grist to his mill.
Derry down, etc."

GROTESQUE DESIGN IN SILVERWARE.

IN our last number we gave an example of the work of the sixteenth century; and now produce a representation of what appears to be the work of an Italian goldsmith at the early part of the seventeenth century.

Fig. 1. being a vase handle. The bold freedom of its design is utilized by the up-heaved figure grasped by the monster, and which gives hold and strength to the handle; the flowing character throughout the composition according well with the general curve of the vase to which it is affixed.



FIG. 1.



FIG. 2.

There is a prevailing elegance in the Italian grotesque design which is not found in that of other nations.

Fig. 2. represents a knife-handle by Francisco Salviati, and is a favourable example of such feeling; nothing can be more *outré* than the figure of the monster which covers the design; yet for the purpose of utility, as a firm hold to the handle, it is unobjectionable, while the graceful convulsions of the neck, and the flow of line in the figure combined with this monster, give a certain quaint grace to the design which is further relieved by enriched foliage.

A VALUABLE Roman gem was some time ago shown in the Wrochester Museum at Shrewsbury. This marvellous gem was a small red carnelian, about three-fourths of an inch in length, and of an oval form. The design which was deeply engraved on it, represented a goblet, on each side of which stood a bird, while from each of their bills a stream flowed into the cup. This gem was found amongst the ruins of the ancient Uriconium. A singularly carved hollow bone was found at the same time, which was supposed to be a charm.—*Chambers's Journal*.

GOLD-FIELDS OF VICTORIA.—The Mining Department of the Colony of Victoria estimate that 249,822 oz. of gold were obtained in the second quarter of the year, 1876, as much as 155,357 oz. being quartz gold. The number of miners at work averaged 42,453, of whom 11,138 were Chinamen. The returns continue to show that mining is gradually being carried on at greater depths in all parts of the colony. There were at the end of the June quarter twelve shafts of mining companies sunk to depths of over 1000 feet, seven of them being at Stawell, three at Sandhurst, and two at Clunes. The deepest shafts in the colony were the Newington, at Stawell, 1783 feet, and the Magdala, at Stawell, 1706 feet.

MIRROR OF THE MONTH.

NOVEMBER.

THIS month was styled by the ancient Saxons *wind-monat* or the *wind-month*, from the gales which are so prevalent at this season, compelling our Scandinavian ancestors to lay up their keels on shore, and refrain from exposing themselves on the ocean till the advent of more genial weather. It also bore the name of *blot-monath*, or the bloody month, from the fact of the custom which then existed to slaughter great numbers of cattle to be salted for winter use. The epithet had possibly also reference to the sacrificial rites practised at this time.

It is generally regarded as the most gloomy month of the year and it is perhaps true that less enjoyment is obtainable in it from, external objects than in any other of the twelve months of the year. This, however, is mainly so in London, as in some parts of the country it is one of the most enjoyable periods. In London, its leaden skies, choking fogs, and torrents of rain, combined frequently with heavy gusts of wind, which shake down the last remaining leaves from the trees, do not by any means conduce to buoyancy and cheerfulness of spirits.

Thomas Hood, the great humorist, depicts in the following lines the *negative* character of November, as exemplified on a foggy day of that month:—

"No sun—no moon!
 No morn—no noon—
 No dawn—no dusk—no proper time of day—
 No sky—no earthly view—
 No distance looking blue—
 No road—no street—no 't'other side the way—'
 No end to any row—
 No indications where the crescents go—
 No top to any steeple—
 No recognitions of familiar people—
 No courtesies for showing 'em—
 No knowing 'em!
 No travelling at all—no locomotion,
 No inkling of the way—no notion—
 'No go'—by land or ocean—
 No mail—no post—
 No news from any foreign coast—
 No park—no ring—no afternoon gentility—
 No company—no nobility—
 No warmth, no cheerfulness, no healthful care—
 No comfortable feel in any member—
 No shade, no shine, no butterflies, no bees,
 No fruits, no flowers, no leaves, no birds, November!"

During three successive years, from 1831 to 1833, the 13th of this month was marked by a magnificent display of shooting or falling stars, those mysterious visitants to our globe, respecting whose real nature and origin science is still so perplexed. The first of these brilliant exhibitions was witnessed off the coasts of Spain, and in the country bordering on the Ohio. The second is thus described by Captain Hammond, of H.M.S. *Restitution*, who beheld it in the Red Sea, off Mocha. "From one o'clock a.m. till after daylight there was a very unusual phenomenon in the heavens. It appeared like meteors bursting in every direction. The sky at the time was clear, the stars and moon bright with streaks of light, and then white clouds interspersed in the sky. On landing in the morning I inquired of the Arabs if they had noticed the above. They said they had been observing it most of the night. I asked them if ever the like had appeared before. The oldest of them replied that it had not." The area over which this phenomenon was seen extended from the Red Sea westwards to the Atlantic, and from Switzerland to the Mauritius.

But the most imposing display of shooting stars on record occurred on the third of these occasions,—that is, on November 13th, 1833. It extended chiefly over the limits comprised between longitude 61 degrees in the Atlantic and 100 degrees in central Mexico, and from the latitude of the great lakes of North America to the West Indies. From the appearance presented, it might be regarded as a grand and portentous display of nature's fireworks. Seldom has a scene of greater or more awful sublimity been exhibited than at the Falls of Niagara on this memorable occasion, the two leading powers in nature water and fire, engaging, as it were, in an emulative display of their grandeur. The awful roar of the cataract filled the mind of the spectator with an infinitely heightened sense of sublimity, when its waters were lightened up by the glare of the meteoric torrent in the sky. In many parts of the country the people were terror-struck, imagining that the end of the world was come, whilst

those whose education and vigour of mind prevented them from yielding to such terrors, were nevertheless vividly reminded of the grand description in the Apocalypse, "The stars of heaven fell unto the earth, even as a fig-tree casteth her untimely figs when she is shaken of a mighty wind."

The most probable theory as to the nature of shooting stars is that they form part of the solar system, revolving round the sun in the same manner as the planetoids, but both infinitely smaller in size, and subject to great and irregular perturbations. The latter cause brings them not unfrequently within the limits of the earth's atmosphere, on entering which they become luminous from the great heat produced by the sudden and violent compression which their transit occasions. Having thus approached the earth with great velocity, they are as rapidly again withdrawn from it into the realms of space. It is very possible, moreover, that the fiery showers which we have just described may be the result of a multitude of these meteors encountering each other, whilst the *aërolites*, or actual meteoric substances, which occasionally fall to the surface of the earth, may be such of those bodies as have been brought so far within the influence of terrestrial gravity as to be rendered subject to its effects.

A REMARKABLE METEOR.

AT the last meeting of the Manchester Literary and Philosophical Society, the President (Mr. E. W. Binney), said that on Tuesday, the 15th of August last, whilst standing on the deck of the packet in Douglas Bay, in the Isle of Man, he observed one of the most brilliant meteors that he had ever seen. At about 35 minutes past 9 o'clock, p.m., Greenwich time, he was looking towards the west, when he observed a body, apparently larger than the planet Jupiter, in the S.S.E., at an elevation of about 30° with the horizon, traversing the heavens at first in a nearly horizontal direction, then gradually declining, and finally disappearing by a steep curve to the N.N.W. When first observed it appeared to be of a yellowish colour, but it changed to a greenish blue before it sank out of sight. During its last stage it reminded him of a large Roman candle, and from its great brilliancy appeared to be not very far from the place where he stood, but he observed no signs of its bursting, and it left little trace of a luminous track behind it. The speed at which it travelled appeared to be less than that of most meteors which he had observed.

This meteor appears to have been observed by several parties, for Mr. J. P. Norris wrote to the *Times* from Abbey House, Bristol, under date of August 15, "A brilliant meteor has this moment fallen due west of this house. It first appeared in the neighbourhood of Arcturus, then seemed to burst and trail light of rainbow colour, and was visible to near the horizon, slanting towards the north. Its distance cannot have been great, for we saw it throughout two-thirds of its course against a dark cloud. It may have fallen therefore, in the neighbourhood of Clevedon." A correspondent, writing from Further Barton, Cirencester, on Wednesday, says, "At about 9.30 yesterday evening (15th), a magnificent meteor was seen from this place, passing slowly across the north-western heavens about midway between Arcturus and the horizon. The colour was vivid pale green, it left a greenish wake behind it, and burst with brilliant scintillations of whiter light"—and another says, "At 9.30 last night, Greenwich time, I saw the finest meteor, or fire ball, that it has ever been my fortune to observe. It passed just below E. Bootes and travelled northwards in a descending direction between A. Canes Venatici and the large cluster in Coma, rather nearer the latter. It exactly resembled the globe of fire projected by a Roman candle; the colour was of a brilliant yellow, and then, after changing to a vivid green the meteor disappeared. The ball was pure and unattended by luminous track."

He gave the above particulars to show how observers were deceived as to the distance of meteors. The party who observed the one on the 15th August, near Bristol, thought that it fell near Clevedon, while he (the president), seeing it at Douglas, 220 miles N.N.W. of that city, imagined it at no very great distance from him. He brought the matter before the society for the purpose of inquiring whether the meteor had been observed by other parties, especially residents in Belfast or Glasgow, in order to ascertain if it had been seen westwards of those two places.

COPPER SOLDER FOR PLATING.—Silver 10 pennyweights; copper 10 pennyweights. This is a useful solder for plating or soldering silver work; it never eats as does silver solder.

SILVER SOLDER FOR GOLD PLATING.—Silver 1 ounce; copper 5 pennyweights; pin-brass 5 pennyweights.

USEFUL RECEIPTS FOR THE TRADE.

SILVER DIAL CLEANING.—Take about a teaspoonful of saltpetre and mix it with about two dessert-spoonfuls of finely-powdered charcoal—willow coal is the best. Let these be ground together with a little water on a piece of slate, with the blade of a knife, then, by the aid of a camel's hair pencil, spread a portion of the mixture evenly over the surface of the dial, which must then be laid on a piece of charcoal, and with a blow-pipe and the clear flame of lamp or gas jet, it must be made just red hot, and kept so till the wet powder has ceased to fly about; it must then be thrown from the charcoal, hot as it is, into a mixture of sulphuric acid and water (in the proportion of about one fluid ounce of acid to three half pints of water); it will then have a snow-white appearance, and must be washed with brush and soap in clean soft water and put into fine sawdust till quite dry, or, what is better, rosewood raspings.

TO RECOVER THE GOLD LOST IN COLOURING.—Dissolve a handful of sulphate of iron in boiling water, then add this to your "colour" water, it precipitates the small particles of gold. Now draw off the water, being very careful not to disturb the auriferous sediment at the bottom. You will now proceed to wash the sediment from all trace of acid with plenty of boiling water; it will require three or four separate washings, with sufficient time between each to allow the water to cool and the sediment to settle, before pouring the water off. Then dry in an iron vessel by the fire, and finally fuse in a covered skittle pot with a flux as before directed.

GILDING ON STEEL.—Dissolve pure gold in aqua regia as usual; evaporate to dryness; mix with strong sulphuric acid, which will dissolve the gold and take its colour; put the mixture in a funnel, the ether will swim on the top of the acid, which should be let run through the funnel, the ether only being used. The steel piece should be highly polished—very well cleaned—then heated, and the solution applied with a pencil: the ether will evaporate, leaving the gold adhering to the steel; the solution may be applied several times.

ORNAMENTAL DESIGNS ON SILVER.—Select a smooth part of the silver, and sketch on it a monogram or any other design you choose, with a sharp lead pencil, then place the article in a gold solution with the battery in good working order, and in a short time all the parts not sketched with the lead pencil will be covered with a coat of gold. After cleansing the article, the blacklead is easily removed by the fingers, and the silver ornament disclosed. A gold ornament may be produced by reversing the process.

TO SOLDER TORTOISE SHELL.—Bring the edges of the pieces of shell to fit each other, observing to give the same inclination of grain to each, then secure them in a piece of paper, and place them between hot irons or pincers; apply pressure, and let them cool. The heat must not be so great as to burn the shell, therefore try it first on a white piece of paper.

CEMENT FOR JOINING AMBER.—A solution of hard copal in pure ether of the consistency of castor oil, is suggested by Ph. Rust for cementing amber. The carefully-cleaned surfaces of fracture coated with the solution, should be pressed together, and retained in contact by means of a string wound around the object, or in some other suitable way. The operation should be performed as rapidly as possible, since the evaporation of the ether impairs the adhesiveness of the cement; so that all arrangements for compressing the object should be made before laying on the cement. A few days are required for the complete hardening of it. In repairing tubes, as for pipes, any of the solution happening to pass into the interior should be carefully removed at once with a slender feather.—*Mechanic.*

TO TAKE SPOTS OFF GILDING.—Boil common alum in soft pure water, and immerse the article in the solution, or rub the spot with it and dry with sawdust.

COMMON SILVER SOLDER.—Silver 20 ounces; pin-brass 13 ounces; spelter 1 ounce.

BISMUTH SOLDER.—Bismuth 12 ounces; lead 15 ounces; tin 21 ounces.

IMITATIONS.

IMITATION SILVER.—Silver 1 ounce; nickel 1 ounce, 11 pennyweights; copper 2 ounces, 9 pennyweights. No. 2. Silver 3 ounces; nickel 1 ounce, 11 pennyweights; copper 2 ounces, 9 pennyweights; spelter 10 pennyweights.

IMITATION GOLD.—Silver 2 ounces, 5 pennyweights; copper 1 ounce; composition (44 ounces copper to 8 ounces spelter), 1 ounce.

BOOK NOTICES.

British Manufacturing Industries. London: EDWARD STANFORD Charing Cross. 1876.

THIS series, which has been a long time in preparation, consists in compact volumes dealing with information connected with the origin and extent of the great manufacturing industries of the country. Although the volumes may fairly be called pocket ones, no person, not having seen them, can form any idea of the compression that has been exercised to get the information within the allotted space. Each volume is made up of several papers upon their cognate subjects, which papers, by the way, have been digested for easy comprehension from elaborate scientific reports and scattered details of every kind, the name of the writer being prefixed to his own particular paper, the whole being under the editorship of Mr. Phillips Bevan, F.G.S. In the subjects with which our readers are more immediately concerned we find "Jewellery," by Mr. George Wallace, South Kensington Museum; "Gold Working," the Rev. Charles Boutell, M.A., and "Watches and Clocks," by Mr. F. J. Britten, Secretary of the Horological Institute. There are also "Musical Instruments" and "Cutlery" in the same volume, but they are not to our present purpose. "Electroplate" will be found in the volume devoted to the Birmingham trades.

The editor states his object to be to enable the general reader to bring into one comprehensible focus the leading features and present position of the great industries of the kingdom, and the enormous development that has taken place in them. The spread of education, and art and science schools, has had an awakening effect that was little foreseen when the first Great Exhibition opened its doors in 1851. The display of foreign manufacturing ingenuity at that time roused us from our believed self-sufficiency, whilst the year 1862 called forth the cry of "technical education" in earnest. Personal adornment is, perhaps, as old as any art, and many of us, looking at the ancient Egyptian jewellery shown in the Exhibitions of 1862 and 1867, wondered at the thought that it was taken from the coffin of Queen Aah Hoheb, near Thebes, and was thousands of years old. We learn from history, both sacred and profane, that the jeweller and worker in gold and silver have always occupied a prominent position in every form of civilization that the world has seen.

The paper on watches and clocks seems to have been somewhat cramped for space, although the most has been made of it, whilst illustrations show the different forms of escapements both in clocks and watches. Looking at the beauty of it, and the smooth, silent action of its motion, we have not as yet seen any escapement that will wean the clockmaker's love from his darling Graham's Dead-beat. Three and double-three legged may come and go, but with respect to the Graham, we may parody the well-known line of the popular song about the "Scent of the Roses," and say of the above that "the love of the watchmaker clings to it still." Mr. Britten also gives us some account of the lever and chronometer, and also of the generally hitherto unknown extent to which machinery is applied in Lancashire by the now celebrated Wycherley, of Prescott, in making watch movements. Each of these papers contain a valuable amount of information, so much so that the man who reads them will be surprisingly pleased, as we were.

Napier's Electro-Metallurgy. CHARLES GRIFFIN & Co., Stationers' Hall Court, London. 1876.

WE do not deem it necessary to give the full title of this capital little book, because, we presume, that during the last five-and-twenty years it has been "looked up to" by every one connected with that part of the silversmith's trade. We found ourselves very glad of its assistance, to enable us to thoroughly reason out the practical work which we described when going over the first-class work of Messrs. Hodd & Son, in September of last year. The present is the fifth edition, "revised and enlarged," in which much new matter has been given. The author says in his new preface that he has "added several things that came under my notice during the active competition which took place between the philosophers and manufacturers to gain a step in advance when the art was new. These have not formed any part of the former editions of this work, and, therefore, I call the reader's attention to this new matter, because the general form of apparatus now used in the art is not suitable for observing many of the phenomena which were of constant occurrence and often of great annoyance when the art was young." We also beg to call the reader's attention to the same facts, and, furthermore, that this new edition is being fully appreciated by those who are in the trade. We are glad to have to record this as a proof that the successful practical application of scientific principles are meeting their well-merited reward.

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THE TREASURES OF GOLCONDA.

THE great temple, jewels, and treasures of Srirangam, chiefly consists of ornaments for the adornment of the god, the Kristna Avatar of Vishnu, on especial occasions. There are armlets and necklaces, and breastplates and crowns, all set with gems—diamond, and ruby, and emerald, and topaz, and opal, and sapphire, and pearl. One necklace of emeralds, rubies, and diamonds, with pearl pendants, is computed to be worth 6 lakhs of rupees (60,000*l.*) The god has several umbrellas, with covers of pearl net work, and one of these bears, according to estimation, 125,000 small, but extremely clear coloured pearls. Amongst the treasures are huge vessels of purest gold, under the weight of which the attendants who show them to the few that are allowed to inspect the temple treasures, stagger as they bring them into the show chamber. The mace of the god is a mass of gold sheathed for the greater part by large flat diamonds.

It is impossible to estimate the intrinsic value of the Srirangam gems. They are badly cut, and some of the largest emeralds, rubies, and diamonds, are scarcely cut at all. Yet some, wretchedly cut as they are, emit a surprising lustre. There are several hundreds of huge pear-shaped pearls, but these again are bored through the centre; and this, although it may enhance the value of the gems in the Hindoo's eye, naturally lessens their value in the estimation of any European jeweller. This Srirangam pagoda received a valuation gift of a portion of these jewels, a few years ago, from a peculiarly holy ascetic. This man, a Brahmin, vowed that for ten years he would not eat a morsel of food or drink a drop of water on any day that he did not receive for the god a donation of 100 rupees. He was, at first, frequently nearly starved to death, but such a devotee was not to be lost to the faith. The pious rallied around him, and, at the end of the stipulated term, he presented the temple with a magnificent necklace of emeralds, and rubies, and other ornaments, worth upwards of 25,000*l.* This story may be taken *cum grano salis*, but, in the main, it is believed to be true.—*Jeweller's Circular.*

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 7d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 6½d. to 4s. 8d. (variable.)

AUSTRIA exhibits at the Centennial; the largest opal in the world (602 carats), and is valued at \$25,000.—*Jeweller's Circular.*

THE Shah of Persia has in his palace a terrestrial globe said to be solid gold. It is surrounded by circles of the same metal, and adorned with all sorts of gems. All the countries are indicated by incrustations of diamonds and precious stones of various colours.—*Ibid*

FEMALE travellers, styled in America trade "drummers," have made their appearance in the Western States. They are piquant, audacious, and fascinating, and hundreds of business men are not returning to their families as early in the evening as usual.

MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

- ADIE THOMAS, Great George Street, Leeds, jeweller. September 25. At Five Ways Tavern, 1, Lady Wood Road, Birmingham, October 10 at 3. E. Lodge, solicitor, Leeds.
- BARNES HENRY GEORGE, 46, Brunswick Street, and 308, High Street, Poplar, pawnbroker, clothier, and jeweller. October 17. At Chapman & Lees, solicitors, Gresham Buildings, Basinghall Street, November 6 at 3.
- CARTWRIGHT GEORGE FREDERIC, Branstons Street, Birmingham, jeweller. September 28. At J. C. Fowke's, sol., Birmingham. October 16 at 12.
- COMBER THOMAS JAMES, 132, Fleet Street, and 52, King's Road, Peckham, Jeweller. Oct. 28. At G. Fresswell's, solicitor, 8, Old Jewry, Nov. 15 at 12.
- DELEENAER JOHN, 38, Barnsbury Road, late 15, Bartlett's Buildings, Holborn, manufacturing jeweller. September 28. At F. E. Brown's, solicitor, 157, Goswell Road, October 25 at 3.
- FEHRENBACH ENGELBERT, Fore Street, Ipswich, watchmaker. October 4. At A. A. Watts', solicitor, Ipswich, October 25 at 11.
- FREW THOMAS and WILLIAM ELLIS, trading as T. FREW & Co., King Street, Penrith, jewellers. At Hinde, Milne & Sudlow's, solicitors, 7, Mount Street, Manchester, in lieu of the place originally named. Sept. 28.
- GRUAR THOMAS GARDINER, Park Street, Newtown, Montgomery, clock and watch maker. Oct. 13. At Harrison & Bonnor Maurice, solicitors, Welshpool, November 3 at 12.
- HAZLEWOOD HENRY, Woodbridge, Suffolk, watchmaker. October 25. At Nichols & Leatherdale's, 6, Old Jewry Chambers, London, November 14 at 12. C. C. Brooke, solicitor.
- KINGSTON JOHN THOMAS, 13, High Street, Ramsgate, watchmaker and jeweller. September 23. At H. Arnold's, solicitor, 27, Finsbury Pavement, October 14 at 3.
- KINGSTON JOHN THOMAS, High Street, Ramsgate, jeweller. October 13. At Walter, Moojen, & Son's, solicitors, 8, Southampton Street, Bloomsbury, October 28 at 2.
- MOGER JAMES ANICETE, Royston, jeweller and silversmith. October 4. At G. Reader's, solicitor, 11, Gray's Inn Square, October 27 at 1. H. Barker, solicitor, Hitchin.
- PYKE ALEXANDER SAMUEL, 26, Ely Place, Holborn, and 75, Guildford Street, Russell Square, jeweller and wine importer. October 28. At Lewis & Lewis', solicitors, 19, Ely Place, Holborn, November 27 at 3.
- RICHARDSON WILLIAM, Market Place, Stretford, Lancashire, watch and clock maker. October 27. At J. A. Horner's, solicitor, 3, Clarence Street, Manchester, November 22 at 3.
- SELIG GABRIEL, 1, Princes Street, Finsbury, dealer in watches. October 18. At Louis Barnett's, solicitor, 23, New Broad Street, November 2 at 3.
- SKINNER WILLIAM, 102, Vyse Street, Birmingham, jeweller. September 27. At Goldsmiths' & Jewellers' Arms, Upper Hockley Street, Birmingham, October 12 at 12. A. Pointon, solicitor, 5, Temple Row, West, Birmingham.
- SPONG AMBROSE REILLY, 16, Spencer Street, Birmingham, manufacturing goldsmith and jeweller. October 16. At R. J. Parr's, solicitor, 27, Colmore Road, Birmingham, November 1 at 3.
- SWINBURN THOMAS, 19, Elvet Bridge, Durham, watchmaker. October 21. At G. Salkeld's solicitor, Durham, November 7 at 11.
- SWINGWOOD WILLIAM HARRISON, Windsor Place, Lodge Road, and Richard Street, Vyse Street, both Birmingham, jewel case maker. October 18. At J. Boraston's, sol., 55, Ann Street, Birmingham, November 2 at 3.
- VOGT ALFRED FIDLES, 8, Marefair, Northampton, jeweller. October 20. At T. Ashdown's, solicitor, Northampton, November 10 at 3.
- WADE BENJAMIN, 2, Exeter Street, Lisson Grove, jeweller. September 27. At C. W. L. Berkeley's, solicitor, 165, Marylebone Rd., October 24 at 4.
- WOLLER ROSINA, 63, Edgbaston Street, Birmingham, clock and watch makers. October 5. At M. J. Blewett's, solicitor, 5, Waterloo Street, Birmingham, October 24 at 11.

Dissolution of Partnership.

- HALL JOHN & Co., 56, King Street, Manchester, goldsmiths and jewellers. HIDSON & MITCHELL, 15, Spencer Street, Birmingham, electro-gilders, silverers, and oxidizers. September 28.

Scotch Sequestrations.

- HUGHES JOHN, 26, Great Hamilton Street, Glasgow, watch and clock maker. Brown, jun., Davies, & Tait's, 65, West Regent Street, Glasgow, October 18 at 12.
- JACOB AARON, 63, Renfield Street, Glasgow, wholesale jeweller, &c. Reid and Mair's, 40, St Vincent Place, Glasgow, November 8 at 12. Decide on offer of composition.

Adjudications of Bankruptcy.

- KELLER PHILIP and EMIL HAHN, 46, Hatton Garden, London, and Warstone Lane, Birmingham, dealers in precious stones. October 12.
- WATTLEWORTH ROBINSON, Whitehaven, jeweller. October 17.

PATENTS.

Application for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

3853. JOHN RICHARDS, of Birmingham, in the county of Warwick, Jeweller, and JAMES TANDY, of Birmingham aforesaid, Jeweller, for an invention of "Improvements in solitaires, sleeve-links, collar and other studs, fastenings for articles of dress and jewellery, bags, and other articles."—Dated 5th October, 1876.
3924. JOHN ALEXANDER LUND, of the firm of Barraud & Lund, of 41, Cornhill, in the city of London, Manufacturers, for an invention of "Improved means or apparatus for synchronizing clocks or other time keepers and for transmitting seconds or other time or intermittent currents."—Dated 11th October, 1876.
3966. EMANUEL FREDERICK GRIFFIN, of Handsworth, in the county of Stafford, Manufacturer, for an invention of "Improvements in solitaires, sleeve links, collar and other studs, buttons, and fastenings for articles of dress and other articles."—Dated 13th October, 1876.
3973. CHARLES PAYNE and PETER STEEL, both of the city of Manchester, in the county of Lancaster, for an invention of "A new or improved device or means for securing scarf pins, brooches, and other description of jewellery."—Dated 14th October, 1876.
3978. HENRY JULIUS HALLPIKE, of Shepherd's Bush, in the county of Middlesex, for an invention of "Improvements in sleeve links, collar studs, and other similar articles."—Dated 14th October, 1876.
4007. JAMES GRASON, of 4, Fore Street, Tiverton, in the county of Devon, Jeweller, for an invention of "An improved self-locking shirt stud, applicable also for other fastening purposes."—Dated 17th October, 1876.

Grants of Provisional Protection for Six Months.

3436. To FREDERICK WEINTRAUD and RICHARD JAMES SECUNDUS JOYCE, of 18, Aldermanbury, in the city of London, Manufacturers, for the invention of "Improvements in solitaires, or sleeve and collar studs."
3353. To JOHN RICHARDS, of Birmingham, in the county of Warwick, Jeweller, and JAMES TANDY, of Birmingham aforesaid, Jeweller, for the invention of "Improvements in solitaires, sleeve links, collar and other studs, fastenings for articles of dress and jewellery, bags, and other articles."

Notices to Proceed.

2554. RICHARD MATHER PRIOR, of Vale Cottage, Highbury, in the county of Middlesex, has given the like notice in respect of the invention of "An improved process of electroplating metal surfaces with nickel."
2797. ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, has given notice in respect of the invention of "Improvements in keyless repeating watches."—A communication to him from abroad by AMI LOUIS JUNOD-PATTUS, of Paris, France.
3616. WILLIAM HENRY DOUGLAS, of Stourbridge, in the county of Worcester, Jeweller, has given the like notice in respect of the invention of "Improvements in studs or clasps."

Patents Sealed.

3356. FRANK MOORE, of Knowle, in the county of Warwick, Tool Maker, for an invention of "Improvements in solitaires, sleeve links, and other similar dress fastenings."

Patents which have become Void.

2783. ARTHUR CHARLES HENDERSON, of the firm of A. C. Henderson & Company, British and Foreign Patent Agents, of 6, Southampton Buildings, Holborn, in the county of Middlesex, for an invention of "Improvements in watches and clocks."—A communication to him from abroad by Adrien Joseph Viret Dubreuil, a person resident at Ham, in the department of Somme, France.—Dated 22nd August, 1873.
2824. ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, for an invention of "Improvements in watch regulators."—A communication to him from abroad by Charles Teske, of Saratoga Springs, in the county of Saratoga, and State of New York, United States of America.—Dated 27th August, 1873.

Patents Granted in Foreign States.

AUSTRIA.

23. B. EGGER, of Vienna, and F. OSNAGHI, of Heiligenstadt, for "Electromagnetic clocks with a peculiar contact apparatus and hobbins."—1 year—(Public.)—Dated 14th April, 1876.

BELGIUM.

- 40,218. G. ZAFFIRA, for an imported invention of "Improvements in watches, clocks, and chronometers."—Dated 10th August, 1876.—(French Patent, 7th August, 1876.)
- 40,340. B. HAAS & Co., for an imported invention of "A clock with a night-light."—Dated 28th August, 1876.
- 40,450. J. R. HOPKINS, for an imported invention of "Improvements in watches."—Dated 16th September, 1876.—(French Patent, 12th September, 1876.)
- 40,546. L. BAZIN, of Fontaine l'Evêque for "A regulator for winding up clocks."—Dated 30th September, 1876.

PRUSSIA.

16. R. FLUGEL, of Wächtersbach, for "Clock-work."—3 years.—Dated 11th August, 1876.

FRANCE.

- 110,627. BUCKELEW, for "A spring watch-case."—Dated 11th December, 1875.
- 110,698. DENEURE and TAQUOX, for "Improvements in the manufacture of going toy-watches."—Dated 15th December, 1875.
- 110,749. MERIQUE, of Besançon, for "A ratchet key for watches, clocks, musical boxes, and lamps."—Dated 27th December, 1875.
- 110,811. MOGIS, for "Applying Brianchon's ornamented stones to jewellery in general."—Dated 23rd December, 1875.
- 113,226. ROGER-SEILLIÈRE and HARDY, for "An electric regulator for controlling and regulating clock-work or motors."—Dated 6th June, 1876.
- 113,313. MRS. FAVELIER, for "Applying elastic objects on jewellery in general."—Dated 12th June, 1876.
- 113,333. WEIRLIN, for "Studs for cuffs, collars, shirts, &c."—Dated 13th June, 1876.
- 113,440. FOURNIER, for "An oriental chain for collars and bracelets."—Dated 23rd June, 1876.
- 113,648. JUNOD-PATTUS, for "Watches with pendant-remontoirs and quarter repetitions, without wheelwork or hammers."—Dated 6th July, 1876.
- 113,668. DE BLONDEAU and DE COSTER, for "A speed-regulator applicable to clocks, motors worked by weights, turnspits, and other instruments."—Dated 12th July, 1876.
- 113,669. BOILLLOT, of Besançon, for "Alloy decorations of watch cases and jewellery."—Dated 13th July, 1876.
- 113,747. JAPY BROTHERS & Co., for "Clocks or watches with a calendar plate."—Dated 13th July, 1876.
- 113,751. MEUNIER, of Marseilles, for "An improved watch."—Dated 17th July, 1876.

Patents on which the Stamp Duty of 100l. has been paid, and Dates of their Production for Certificate, to 21st October, 1876, inclusive.

3028. JOHN MATTHIAS AUGUSTUS STROH, Mechanician, of 29, Tolmer's Square, Hampstead Road, London, in the county of Middlesex, for an invention of "Improvements on electro-magnetic clocks, parts of which improvements are applicable to mechanical clocks."—Dated 18th October, 1869.

CHRONOLOGICAL UTILITY OF ECLIPSES.

THE dates of historical events have been often rendered uncertain, or have been actually displaced, by the errors of contemporary writers, by those of their transcribers, and by various other accidents. If, however, the annals of nations had been constantly associated with astronomical observations, or, above all, with celestial phenomena, the recurrences of which have been calculated with precision, we should have a certain number of fixed points to which we could refer the principal historical events of past ages. Even if uncertainty existed of the precise epoch at which important circumstances happened, such observations would serve to confine their date between two eclipses, and thus bring them near to the true time.

Towards the middle of the eighteenth century certain astronomers calculated all the eclipses which had taken place since the commencement of the Christian era; and to render their labours still more useful to future generations, they advanced their calculations so as to include the year 2000. This was a suggestion to annalists to confirm the chronological order of their narratives by the testimony of contemporaneous celestial events. The Chinese always adopted this precaution, hence their chronology is more authentic than that of any other nation.

There are some circumstances, indeed, upon which eclipses exercise a greater or less influence, and which it is possible to verify by tracing the date and peculiarities of the heavenly phenomena. Thus, for instance, before examining if it be true that the terrors inspired by a total eclipse of the sun was the chief cause of Louis I.'s death, it is necessary to seek for the date of the eclipse. This we find to be May, 840, the exact month and year at which the historians of the time fix the death of the French King.—*Magasin Pittoresque.*

THE WATCHMAKER, JEWELLER, SILVERSMITH, AND KINDRED TRADES' DIRECTORY.

The important feature of our Directory Columns will be found to be a most effectual method of keeping the Names of Firms and Manufacturers before the constant notice of the Trade.

No Charge is made for Insertion of a Two-line Entry of Name and Address of Firms whose advertisements, occupying not less than one-third of a page, appear for twelve consecutive months. In other instances, the Charge for the Two-line Entry of Name and Address is £1 1s. per annum; four lines, £1 10s. per annum; six lines, £2 2s. per annum. No Charge is made for the heading or title under which any entry appears.

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HENDRY (W. T.) & CO., 2 and 12, Wilson Street, Finsbury, E.C. Sole Agents for the United Kingdom for Bourden's Metallic Barometers and Thermometers, Manufacturers of Aneroid Barometers, and Marine Salinometers and Hydrometers, in Metal and Glass.
MURRAY & CALLIEU, 22, St. John's Square, E.C.
NEGRETTE & ZAMBRA, Holborn Viaduct, E.C.: Charterhouse Street, E.C.; 45, Cornhill, E.C.; 122, Regent Street, W.
WEBSTER, J., 88, St. John Street Road, Clerkenwell, E.C.

BURGLAR AND FIRE PROOF SAFE MAKERS.

CHATWOOD'S, 120, Cannon Street, E.C., and Lancashire Safe and Lock Works, Bolton.
GEERING & TALBOT, Apollo Safe Works, Moseley Street, Birmingham.
PHILLIPS & SON, Speedwell Works, Sherborne Street, Birmingham.
THE SICKER SAFE AND STRONG ROOM COMPANY, LIMITED, Soho, near Birmingham.
WHITFIELD (F.) & CO., Whitfield's Patent Screw Bolt and other Safes. Viaduct Works, Oxford Street, Birmingham.

CLOCK MAKERS.

BRUGGER & STRAUB, 79, High Holborn, W.C.
CAMERER, KUSS, FRITSCHLER, & CO., 522, Oxford Street, W.C., and 2, Broad Street, Bloomsbury, W.C.
COHEN (JACOB) & CO., 36 and 37, Ely Place, E.C., and Charterhouse Street, E.C., London; and 10, Rue Béran-ger, Paris.
GILLET & BLAND, Steam Clock Factory, White Horse Road, Croydon. Exhibition Medal, 1873. Makers (to her Majesty's Government) of Worcester Cathedral Chimes at Bradford and Rochdale Town Halls, Boston, St. Stephen's Church, Hampstead, &c.; and of Clocks of every description; also patent Carillon Machines. Sole Proprietors and Makers of Patent No. 4141, for improvements in Church and other Bell Music. Established 1844.
GREENWOOD (JOHN) & SONS, Importers and Manufacturers of Clocks and Watches. Wholesale and for Exportation. Farringdon Road, near Clerkenwell Green, London, E.C.
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MARCUS (MAURICE) & CO., Waterloo House, Holborn Viaduct, London, E.C.
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HUTTON & CO., 5 and 6, Newgate Street, E.C., and Phoenix Court, Newgate Street, London, E.C.

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BLUMBERG & CO., 2, Cannon Street, London, E.C.
JONES, A. EDWARD, 93, Hatton Garden, London, E.C.
LITTEN (T. R.), 64, Hatton Garden, London, E.C.
WILLIAMSON, HENRY, 85, Old Street, St. Luke's, London, E.C.

JEWELLER'S MATERIALS.

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WATCH CAP MAKER.

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WATCH CASE MAKERS.

DUNN, HENRY, 48, Rahere Street, Goswell Road, Lon- don, E.C.
NEWMAN, JAMES THOMAS, 42, Spencer Street, Gos- well Road, London, E.C.
STRAM, ALFRED, 12, Ashby Street, London, E.C.

WATCH DIAL PLATE MAKER.

WILLIS, THOMAS J., 10, Rydon Crescent, St. John Street Road, London, E.C.

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PENLINGTON & HUTTON, Chronometer and Watch Manufacturers, 2 and 3, St. George's Crescent, Liverpool.
SWINDEN & SONS, 27, 28 & 29, Temple Street, Bir- mingham.

WATCH AND CLOCK MATERIAL DEALERS.

BEDFORD, H. E., 12, Crown Street, Halifax.
COWEN, DAVID, 28, Withy Grove, Manchester.
MEREDITH (WILLIAM) & SON, 260, Goswell Road, London, E.C.
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SAGGERSON, ROBERT, Wheel Cutter and Dealer in Watch Materials, Files, Tools, &c., Prescott, Lancashire.
SWINDEN & SONS, 27, 28 & 29, Temple Street, Bir- mingham.
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ASTON, HENRY M., the original Wedding and Keeper Ring Manufacturer. An Extensive and varied stock always on hand. 12 Regent Place, Birmingham.

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MANUFACTURING JEWELLERS AND GOLDSMITHS,
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CHOICE BRILLIANT AND GEM RINGS. FINE SILVER-SET DIAMOND WORK. DIAMOND SUITES
IN GOLD AND ENAMEL, ETC., ETC.

A Large and Choice Stock always on hand for selection.



A MONTHLY TRADE JOURNAL,

Devoted to the Interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades.

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HOROLOGY.

(Concluded.)

XIX.—DIALLING.

WE have now arrived at the last of this very interesting subject, and as befits the end, this article will treat of moon dials and the night. These nocturnal dials are of two kinds; lunar and sidereal. As the sidereal one is too complicated for ordinary use, we will pass it by, and confine ourselves to the lunar part.

A moon dial is, as its name implies, an instrument which shows the hours of the night by means of the shadow of the moon projected on it from an index, much after the way that the sun does the hours of the day; with some important difference in matters of detail, which we will endeavour to explain as well as we can without a diagram.

Suppose, for example, it was required to construct a horizontal moon dial; the first method of procedure would be on the basis of the horizontal sun dial. We may here remark, by the way, that these moon dials are very interesting on bright moonlight nights, as many a happy evening family party can testify. Let us try to simplify the construction as much as possible.

Take the paper upon which the work has to be first draughted, and make it as square as possible; say, 12 inches each way. Next, down the centre of it, leaving a margin of a couple of inches each, top and bottom, draw a straight line; this line will be the meridian, and, as may have before been explained, is that part of a great circle of the globe that is supposed to pass directly over the head of the observer, or the continuation of the highest point that the sun

reaches in the day. It is more commonly called the "12 o'clock line." Thus, every place has its own meridian; London has one, Liverpool another, &c. This will be readily understood by taking an apple or an orange, driving a skewer through the centre, and turning it slowly round under some small mark above it, say the cross bar of the gas burners. The skewer will represent the axis of the earth, whilst the bar will be a portion of the meridian. As you turn your little sphere you will see that as one part passes away on one side, another comes under the bar, &c. In these islands, however, for all the purposes of every day life, we take the meridian of Greenwich everywhere.

Having fixed the meridian at about one-fourth the distance down that line, draw another at right angles, and of the same length as that distance; then connect these two lines by another having an angle equal to the elevation of the pole, and mark your three points A, C, and D respectively. Now, from D, produce a further line that shall make a similar angle to that which has been already described, marking it on its termination at the meridian as E. From the point E with the distance C E, make a point lower down still on the meridian, and let it be B. Here, again, draw straight to the right, exactly as before, and mark it F. Then, from the point B, with the pencil leg on F, describe a circular line terminating in E, which line will make the figure a small quadrant. This quadrant will have to be divided into six equal parts, which having been done, produce a horizontal line, G H. Next run the quadrant lines from B through the several points of the arc until they touch the horizontal line. Now, from A on the meridian, draw other lines at such an inclination that each one shall touch the extremities of the quadrants on the horizontal, and make a counterpart of these on the left-hand side of the meridian; at the bottom of all draw a second horizontal line, and mark it as may be

thought most convenient. We will here put at the upper and lower points of the meridian the figures to indicate 12 o'clock. On the space between the two horizontal lines draw a sufficient number of lines so as to divide that space into twelve equal parts. Taking the lower line as the first one, we appropriate it to the day of new moon, and the second to the day when the moon comes an hour later to the meridian than the sun. On each side of the square, parallel to the meridian, draw a boundary line joining all the horizontals; these lines will afterwards become the places of hour-lines. The intersections of the moon-lines with the hour-lines will give points through which to draw curved lines from the lower meridional 12 to the fourth space corner on the right hand, which curve will be the meridian of the moon, and will also be marked 12. The next curve starting from the bottom horizontal line, a space towards the right will be 11, and the furthest on 10 o'clock. Passing the central meridional line to the left, with similar spacing we mark the figures 1, 2, and 3, on the left hand corner. Following upwards from that corner, on the same side, we mark 4, 5, 6, 7, 8, 9, 10, 11, and 12; and again, 1, 2, 3, 4, 5, and 6. We next begin on the left hand hour-line, and, on the space above 12 we write 1, 2, 3, 4, 5, 6, 7, and 8. And here comes a strange phase in our work. Having got our hour-lines up each side and along the bottom, we blot out all the twelve space lines, quadrants, upper horizontal and meridional lines; in fact all the work within the boundary lines of the paper. We only wanted it to determine the hour-lines by, and now we will begin afresh.

Draw a new horizontal line at one third the distance from the upper boundary line, and mark each extremity 6, 6. From the centre of the last named line have a point marked for other lines, to be mentioned presently. Now divide the space between the new horizontal line and the bottom one by parallel lines into fifteen equal parts, answering to the fifteen days between new and full moon; upon these several lines write the day of the moon's age, proceeding thus: Begin at the bottom line and write 1, then 2, 3, &c., up to 15 on the topmost space; then parallel to this, come down with 29, 28, 27, &c., to the bottom where you will mark 16. Having got all your figures, you next proceed as before directed to make your lunar curves for the various meridians of the moon. Now, as the moon's age can always be learnt from a good almanac, and having erected the dial style according to previous instructions with respect to the elevation of the pole, the intersection of the line of the moon's age with the lunar hour-lines will give the hour of the night. Again, from the centre of the new horizontal line construct a meridian to the centre of the uppermost parallel; then proceed for a series of hour-lines upon that parallel exactly in the way that was indicated upon the horizontal line previously blotted out. We have already stated that the corners of the upper horizontal were to be marked with the figure 6. That on the right-hand side would be 6 o'clock in the morning, whilst that on the left would be 6 in the evening. Continuing from the 6 on the right towards the meridian we should have hour-lines respectively of 7, 8, 9, 10, 11, and 12, a.m. Running along to the left from 12, there would be 1, 2, 3, 4, and 5. The hours from 8 a.m. to 4 p.m., will all be on the horizontal, whilst the others would be on the vertical boundary lines.

Another kind of moon-dial is the portable one. First of all we have to consider the plane, upon which the draft is made to be equal to the elevation of the equator, and we describe a circle of the size of our proposed dial; having done which we divide it into twenty-nine equal parts. From the centre of that circle we describe a smaller one, which we divide into twenty-four equal parts for the hours; this one is, afterwards, made moveable by being cut out and attached. In the centre we raise an index as for an equinoctial dial.

To use this instrument, set it up after the manner of an equinoctial dial, when the 12 o'clock being turned in line to the day of the moon's age, will give by the shadow of the index, the hour of the morning before sunrise, or after sunset.

There is, also, a method by which a solar dial may be made to answer the purpose of a moon-dial. To do this you must observe the hour which the index shadows by the moonlight, then find the moon's age by the calendar, and multiply the number of days by $\frac{2}{3}$, and the product will be the number of hours which will have to be added to that shown by the shadow to give the time required.

In addition to dials as time-tellers, there are the dialling-globe, the dialling sphere, and dialling-lines, or scales. The first-named is a brass instrument, or it may be wood, with a plane in accordance with the horizon, and a suitable index. This globe and its fittings is specially contrived to enable a student to draw all kinds of dials by its aid, as well as giving a clear insight into the principles of the art of dialling. Then there is the dialling-sphere, another brass instrument, having semi-circles sliding over one another. These are on a moving horizon for the purpose of demonstrating the nature

of the doctrine of spherical triangles; it will, furthermore, impart a scientific knowledge by demonstration of the true methods of constructing dials on every variety of plane. In addition to these, there are the dialling-lines, or scales, that we see on some rules, the edges of quadrants, and similar philosophic instruments, to simplify the construction of dials. These lines consist of a scale of six hours, or two lines of tangents of 45 degrees each, joined in the middle, with the declination set against the latitude of the place that it is intended for. The next is a line of latitudes which is computed for the hour scale on the principle that, as the radius is to the chord of 90 degrees, so are the tangents of each respective degree of the line of latitudes to the tangents of other arcs. The line of hours and latitudes are generally used for marking on all dials that have centres.

In bringing the subject of dialling to a close we may be permitted to say a few last words upon its antiquity. We mentioned something about that at first, but merely as an introductory phrase or two. Vitruvius speaks of the Chaldee historian BEROSUS, whilst others mention MILESIUS and THALES, as the inventors of dials. BEROSUS made a plane reclining dial almost parallel to the equinox, whilst ARISTARCHUS, SAMIUS invented the hemispherical dial, with a needle of those days for a *gnomon*, or style. There was, also, what was called the discus of Aristarchus, which was a horizontal dial. But it was long after these dials that the Romans became acquainted with them. We read that the first sun-dial set up at Rome was by PAPYRIUS CURSOR about the year 460 after the building of the city. Before that time, says Pliny, the elder, there was no mention of any account of time, except by the observation of the sun's rising, motion, and setting. It is recorded of VALERIUS MESSALA that he took to Rome a dial that he had brought out of Sicily; but on account of the difference of latitude between the two places, of course it never showed proper time. However they were not long in improving. As dialling is founded entirely on the motion of the sun as we see it, or strictly, on the diurnal rotation of the earth, where demonstrations of principles are not required, the construction seems to us to be easy enough. We have endeavoured to still further simplify that construction, but whether we have succeeded or not we must here take our leave of DIALLING.

CONTROLLED PUBLIC CLOCKS.

THERE has long been a talk about setting up in the streets of Paris a quantity of clocks, or rather dials, marking the time with the absolute and unerring uniformity ensured by electricity. According to a generally well-informed French paper, the plan is now ripe for execution, and will be shortly carried out, the municipal street authorities being impelled to the step by the success of the similar dials long since erected in the principal railway stations.

It will remain to be seen how in the construction of the new dials utility will be combined with picturesqueness and effect. At present the clocks which adorn some few of the kiosks on the principal boulevards are not much more notable for accuracy than the erratic timepieces doing duty in the shops hard by. Nor are they sufficiently conspicuous to attract the eye of more than one out of every three ordinary passengers. But he would be a rash man who supposed that French ingenuity would not be equal to the task of carrying out effectively the work now to be taken in hand. The Parisian will delight in the new clocks, and consider them a fresh proof of the superiority of his city over any other in the world.

Besides the novelty of the clocks themselves, there will be the fun of writing above or round or under them appropriate mottoes, a work to which as much trouble will be devoted as would suffice in most towns to organize a whole set of laws. A specimen of the sort of motto that may be expected is already to be seen on the great clock outside the Palais de Justice. It consists of a couple of Latin hexameter lines, in which an austere moral lesson is drawn from the "machine" inside, and a dry analogy made out between the regularity of clocks and the rectitude which ought to distinguish the mental system of man. There are, of course, examples of this motto mania on many other belfries, and in the remote country parishes of France the inventive genius of the clock moralist is often far more lively and bold than in this country. A collection of these would go a long way towards furnishing the materials for a moral treatise on Time. Hitherto, however, the extreme irregularity of the work has decidedly deteriorated from the force of the epigrams, and has put them at a manifest disadvantage when compared with the more ancient sermons engraved upon sun-dials.—*The Globe*.

RECOVERED RINGS.

IN the "*Acta Sanctorum*" a curious legend is related in connection with the life of Kentigern, as to the finding of a lost ring. A queen, having formed an improper attachment to a handsome soldier, put upon his finger a precious ring which her own lord had conferred upon her. The king, made aware of the fact, but dissembling his anger, took an opportunity, in hunting, while the soldier lay asleep beside the Clyde, to snatch off the ring and throw it into the river. Then returning home along with the soldier he demanded of the queen the ring he had given her. She sent secretly to the soldier for the ring, which could not be restored. In great terror she then dispatched a messenger to ask the assistance of the holy Kentigern. He, who knew of the affair before being informed of it, went to the river Clyde, and having caught a salmon, took from its stomach the missing ring, which he sent to the queen. She joyfully went with it to the king, who, thinking he had wronged her, swore he would be revenged upon her accusers; but she, affecting a forgiving temper, besought him to pardon them as she had done. At the same time she confessed her error to Kentigern, and solemnly vowed to be more careful of her conduct in future.*

In the armorial bearings of the see of Glasgow, and now of the city, St. Kentigern's tree, with its bells, forms the principal object, while its stem is crossed by the salmon of the legend, bearing in its mouth the ring so miraculously recovered. Fabulous as this old church legend may appear, it does not stand quite alone in the annals of the past. In Brand's "*History of Newcastle*" we find the particulars of a similar event, which occurred at that city in or about the year 1559. A gentleman named Anderson—called in one account Sir Francis Anderson—fingering his ring as he was one day standing on the bridge, dropped the bauble into the Tyne, and of course gave it up as loot. After some time a servant of this gentleman bought a fish in Newcastle market, in the stomach of which the identical lost ring was found.†

An occurrence remarkably similar to the above, is related by Herodotus as happening to Polycrates, after his great success in possessing himself of the island of Samos. Amasis, king of Egypt, sent Polycrates a friendly letter, expressing a fear for the continuance of his singular prosperity, for he had never known such an instance of felicity which did not come to calamity in the long run, therefore advising Polycrates to throw away some favourite gem in such a way that he might never see it again, as a kind of charm against misfortune. Polycrates consequently took a valuable signet ring—an emerald set in gold and sailing away from the shore in a boat—threw this gem, in the sight of all on board, into the deep. This done, he returned home and gave vent to his sorrow.

It happened, however, five or six days afterwards, that a fisherman caught a fish so large and beautiful that he thought it well deserved to be made a present of to the king, so he took it with him to the gate of the palace, and said that he wanted to see Polycrates. Polycrates allowed him to come in, and the fisherman gave him the fish with these words:—“Sir king, when I took this prize I thought I would not carry it to market, though I am a poor man and live by my trade. I said to myself, it is worthy of Polycrates and his greatness, and so I brought it here to give it you.”

This speech pleased the king, who thus spoke in reply—

“Thou didst well, friend, and I am doubly indebted, both for the gift and for the speech. Come, now, and sup with me.” So the fisherman went home, esteeming it a high honour that he had been asked to sup with the king. Meanwhile, the servants, on cutting open the fish, found the signet of their master in its belly. No sooner did they see it than they seized upon it, and hastening to Polycrates with great joy, restored it to him, and told him in what way it had been found. The king, who saw something providential in the matter, forthwith wrote a letter to Amasis, telling him all that had happened. Amasis perceived that it does not belong to man to save his fellow man from the fate which is in store for him, and likewise felt certain that Polycrates would end ill, as he prospered in everything, even finding what he had thrown away. So he sent a herald to Samos, and dissolved the contract of friendship. This he did, that when the great and heavy misfortune came he might escape the grief which he would have felt if the sufferer had been his loved friend.‡

In Scottish family history there are at least two stories of recovered rings, tending to support the possible verity of the Kentigern legend. The widow of Viscount Dundee—the famous Claverhouse—was met and wooed at Colzium House, in Stirlingshire, by

the Hon. William Livingstone, who subsequently became Viscount Kilsyth. The gentleman gave the lady a pledge of affection, in the form of a ring, having for its posy, “*Yours Only and Ever*.” She unluckily lost it in the garden, and it could not again be found, which was regarded as an unlucky prognostic for the marriage that soon after took place. Nor was the prognostic falsified by the event, for not long after her second nuptials, while living in exile in Holland, she and her only child were killed by the fall of a horse. Just a hundred years afterwards the lost ring was found in a clod in the garden, and has since been preserved at Colzium House. The other story is less romantic, yet curious, and of assured verity. A large silver signet ring was lost by Mr. Murray, of Pennyland, in Caithness, as he was walking one day on a shingly beach bounding his estate. Fully a century afterwards it was found in the shingle, in fair condition, and restored to Mr. Murray's remote heir, the present Sir Peter Murray Threipland, of Fingask, baronet.

Professor De Morgan, in “*Notes and Queries*” for December 21, 1861, relates an anecdote of a recovered ring nearly as wonderful as that connected with the life of Kentigern. He says he does not vouch for it, but it was circulated and canvassed nearly fifty years ago, in the country town, close to which the scene is placed, with all degrees of belief and unbelief. A servant boy was sent into the town with a valuable ring. He took it out of its box to admire it, and on passing over a plank bridge he let it fall on a muddy bank. Not being able to find it he ran away, took to the sea, finally settled in a colony, where he made a large fortune, and returning after an absence of many years bought the estate on which he had been servant. One day, while walking over his land with a friend, he came to the plank bridge and there told his friend. “I could swear,” said he, pushing his stick into the mud, “to the very spot on which the ring dropped.” When the stick came back the ring was on the end of it.”

PRINCE RUPERT'S JEWELS.

IN 1683 Prince Rupert, dying rather poor, a plan was devised to “raise the wind” by disposing of all his jewels, but as the public were not satisfied with the mode of drawing the lotteries, on account of the many cheats practised on them, they would not listen to any proposals until the King himself guaranteed to see that all was fair, and also that Mr. Francis Child, the goldsmith, at Temple Bar, London, would be answerable for their several adventures, as appears by the *London Gazette*, October 1, 1683: “These are to give notice, that the jewels of his late Royal Highness, Prince Rupert, have been particularly valued and appraised by Mr. Isaac Legouch, Mr. Christopher Rosse, and Mr. Richard Beauvoir, jewellers, the whole amounting to 20,000*l.*, and will be sold by way of lottery, each lot to be 5*l.* The biggest prize will be a great pearl necklace, valued at 8000*l.*, and none less than 100*l.* As soon as the whole sum is paid in, a short day will be appointed (which, it is hoped, will be before Christmas) and notified in the *Gazette*, &c., for the drawing thereof, which will be done in his majesty's presence, who is pleased to declare that he himself will see all the prizes put in amongst the blanks, and that the whole will be managed with equity and fairness, nothing being intended but the sale of the said jewels at a moderate value.”

Further reference is made as to the responsibility of the said Mr. Child to the several adventures.

Mr. Child was the first regular banker; he began business soon after the Restoration, and received the honour of knighthood. He lived in Fleet Street, where the shop still continues, though probably, with its venerable and tottering neighbour, soon doomed to removal or alteration.

A subsequent notice says, “that the king will probably, tomorrow, at the Banqueting-house, see all the blanks told over, that they may not exceed their number, and that the papers on which the prizes are to be written shall be rolled up in his presence.”

Fancy our Queen employed in sorting, folding, and counting blanks and prizes in a lottery, even if such things were tolerated in our days of progress!

ROYAL TREASURES.

THE Ex-empress Isabella of Spain is stated to have the most valuable collection of laces in the world. According to the *Paris Figaro*, she possesses, among other things, one dress which is valued at 4000*l.* Indian shawls and sapphires are said to be the speciality of Queen Victoria. The Empress of Russia is declared to have an unsurpassed collection in turquoises and pearls; the Empress of Austria is unrivalled for emeralds, while the most perfect collection of rubies belong to the Grand Duchess of Saxe-Weimer.

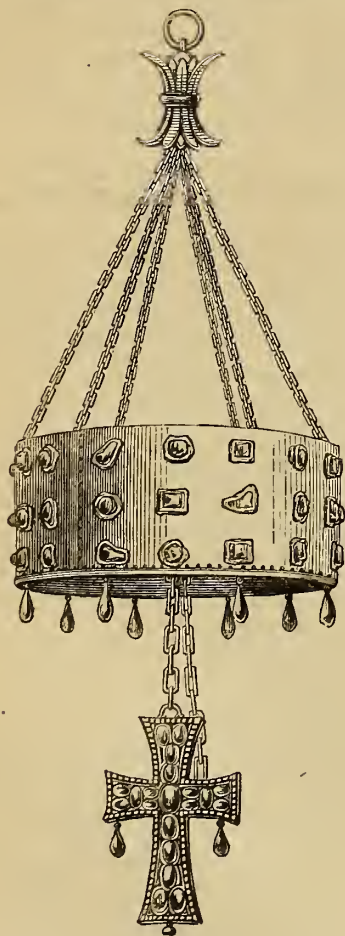
* *Acta Sanctorum*, i. 820.

† Brand's "*History of Newcastle*."

‡ Rawlinson's "*Translation of Herodotus*."

NOTES OF AN ANCIENT GOTHIC CROWN.

TOWARDS the close of 1858, or early in 1859, in the course of excavations at La Tuente de Guarraz, near Toledo, on the property of some private individual, a hoard of treasure of great value and interest was brought to light. No particulars of the discovery are recorded. It seems, however, that there were not found any remains of a case or casket in which the relics had been enclosed; in several parts the ornamentations had been filled with the soil in which they were found; it has, therefore, been supposed that these relics of royalty had been buried in some time of confusion; without any enclosure. The spot where the crowns were found was uncultivated land, which the peasants were breaking up when the discovery was made. The treasure consisted of eight crowns: four are of gold richly jewelled; from the front of the crowns jewelled crosses are suspended by gold chains; there are also chains of the same metal for the purpose of hanging the crowns in some convenient situation. These ancient and precious objects were brought to Paris in the month of January, 1859, by the proprietor of the land where they were found, and the crowns were immediately purchased by the Minister of Public Instruction, for the national collection at the Hotel de Cluny, a museum which is already possessed of many valuable examples of mediæval art, besides specimens of more ancient date. The largest of the crowns bears the following inscription



in letters jewelled and appended by little chains to its lower margin: **RECESEVINTHUS REX OFFERET**; the letters are about two inches in length each; they are separately hung, and to each is attached a pendant of pearl and sapphire. The gold letters are beautifully incrustated with precious stones, and engraved in the same manner as some of the gold work of the Anglo-Saxon period. By means of the inscription we are able to arrive at a knowledge of the date of this crown, for King Recesvinthus governed Spain from 653 to 675; the inscription also shows that it has been an offering (probably to some religious shrine) by this ruler; and the seven other crowns, of smaller dimensions and value, may have been those of the queen and the princes and princesses of the family; some of them, judging by their size, are intended for children of early age—the whole being a solemn offering on some important occasion.

In ancient times it was customary to enrich the saintly shrines with choice and valuable gifts; amongst these, however, there were often imitation crowns and other objects given as votive-offerings, to be placed over the altars, or in some other conspicuous position. There are, however, instances of the crowns which were actually worn by kings and queens having been devoted to this purpose. It is to be observed that the gold chains by which those relics were suspended, have been added to the simple circlets, which were no doubt actually worn by royal personages about twelve hundred years ago, since they are formed with rings and fastenings to facilitate the fastening of them to the heads of the wearers.

The crowns of the kings measure about 9 inches in diameter, and 27 in circumference; it is a hoop about four inches in breadth, and upwards of half an inch in thickness; it is, however, not solid, but formed of massive gold plates soldered together. The margins of this hoop consist of two bands of *cloisonné* work, with incrustations of carnelian; and it is still further enriched with thirty oriental sapphires of large size, set in colets, giving to the gems a very prominent relief. Thirty very large pearls are arranged alternately with the sapphires. The intervening spaces are pierced in open work, and engraved so as to represent foliage and flowers, and to the lower margin is appended the fringe of letters already mentioned. The golden chains are united above with foliated ornaments, which are enriched with numerous pendant pearls and sapphires, and surmounted by a capital, in the form of a knot of crystal, elaborately carved and polished, and terminating in a globe of the same material. The Latin-shaped cross, suspended from the crown by a slender chain, is set with six fine sapphires and eight pearls of remarkable dimensions, mounted in very high relief; jewelled pendants are also attached to the limbs and foot of the cross. This has been worn as a fibula or brooch, the acus by which it has been fastened to the royal robes being still visible. The entire length of this combination of ornament, from the gold hook to which it is fastened to the lowest pendant sapphire attached to the cross, is about 3 feet. The crown is composed of the purest gold, the colour of which, with the violet sapphires, alternating with the pearls, &c., presents a most gorgeous appearance. The crown, of which we give an engraving, was probably worn by the queen of Recesvinthus. The broad circlet is set with fifty-four rubies; sapphires fringe its lower margin. Above and below, near both edges of this circlet, there are little loops which seem to have been used for fastening a lining or cap of some costly tissue within the golden hoop, to protect the forehead of the wearer. The pendant cross is not so much decorated as that above mentioned, being, however, richly set on both sides with sapphires. The same jewels are also suspended from the cross. The eight other crowns are of several fashions. Three are essentially different from the others, for instead of a broad band the circlet consists of an open framework of gold, formed of three horizontal hoops and numerous traverses, with gems set at the points of intersection; all the crowns are enriched with no less than fifty-four precious stones and pearls, and have also hanging fringes of sapphires.

On the pendant crosses of one of the crowns is engraved the following dedication:—*In Dei Nomine Offeret Sonnice Sanctae Mariae In Sorbaces*. After the word *Nomine* a leaf is introduced as a stop. M. Du Someras considers that *Sonnica* is a male appellation. The three smallest crowns had no pendant crosses. As an example of ancient art workmanship, this may be regarded as one of the most remarkable discoveries which have been made in recent times. Our neighbours have reason to congratulate themselves that they have gained possession of such a prize.

THE GOLDEN TOOTH.

IN 1593 it was reported that a Silesian child, seven years old, had lost all its teeth, and that a golden one had grown in the place of a natural double one. In 1595 Horatius, professor of medicine in the University of Helmstadt, wrote the history of the "golden tooth." He said it was partly a natural event and partly miraculous, and that the Almighty had sent it to this child to console the Christians for their persecution by the Turks.

In the same year Rutlandus drew up another account of the golden tooth. Two years afterwards, Ingosieturus, another learned man, wrote against the opinion which Rutlandus had given on this tooth of gold. Rutlandus replied in a most elegant and erudite dissertation. Libsavius, a very learned man, compiled all that had been said relative to this tooth, and subjoined his remarks upon it. Nothing was wanting to recommend these erudite writings to posterity, save one only thing, that is, that the tooth was gold; but, alas, for all these speculations, a goldsmith examined it and found it a natural tooth, artificially gilt.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 125.)

IN the same museum is a watch in blue enamel, set with paste diamonds; the diameter being $1\frac{1}{2}$ inches. It is of French manufacture, and the date is about 1780-90. It was purchased for 3*l.* 3*s.* 2*d.*. Also a watch in a heart-shaped gold locket case, which is enriched with arabesques in *champlevé* enamels. The maker's name is Constantin, of Geneva. This watch is of the eighteenth century; its height is $1\frac{3}{4}$ inches, its width $1\frac{1}{4}$ inches; and it was purchased at the Bernal sale for 5*l.* 5*s.* Also a watch case of gold, enamelled with classical figures in camailu on a brown ground. It is of the eighteenth century; its diameter is $1\frac{3}{4}$ inches; and it was purchased for 4*l.* 10*s.* Also a watch in a plain silver case, which was presented by the Rev. R. Brooke, of Gateforth House, Selby. The maker's name is Thomas Johnson, of Richmond; the date is the eighteenth century; and the diameter of the outer case is 2 inches. Also a watch in a plain silver case, of the eighteenth century, the maker's name being Robert Henderson, of Scarborough. The diameter of the outer case is $1\frac{3}{4}$ inches. Also a watch in a plain silver case of the same date, the maker's name being Henri Hindley, of York. The diameter of the outer case 2 inches. The maker was John Spence, of London. A round silver-gilt alarum repeater-watch with gilt dial plate, showing the hour and the day of the month, and a pierced floriated back. The maker was Shelton. A round silver watch, engraved with a basket of fruit and birds, and having a silver dial, showing the hour and the days of the month. The maker was John Smeaton, of York. The following watches of the eighteenth century are now in the possession of their owners undermentioned.—Sir W. Lawson, Bart., has a silver watch by Jackson, in an outer case of tortoise-shell, piqué with silver, the silver dial showing the hour and the days of the month. Mr. T. Rainey has a melon-shaped watch made by Amalie Frères, ornamented with blue enamel, semeé with gold stars, the stalk forming the handle; it is $1\frac{1}{4}$ inches in diameter: attached is a gold leaf-shaped key. Also a small gold shield watch, by Singleton, of Paris, set round with pearls, with two dials, one showing the hour, and the other the balance-wheel. On the back is a painted enamel bouquet of flowers. It is $1\frac{1}{2}$ inches in diameter. Mr. H. Munster has a French gold watch with a gold face, pearl borders, green enamelled back, and a painting of a boy with a mousetrap and a dog. Also a gold watch enamelled in imitation of an apple with green leaves, edged with pearls. Also a repeating-watch in pierced gold, the case being of shagreen ornamented with piqué dots. The maker's name is James Charwell, of London; the date is the eighteenth century, and the diameter of the outer case is 2 inches. These watches also were presented by the Rev. R. Brooke.

Lady Fellows has the following watches of the eighteenth century. A round metal-gilt watch with chased back of Venus and Cupid. The dial plate has the numerals inserted in white enamel. The maker was Tosue Panier à Paris. A gilt plain watch with silver engraved wreaths round the side. The maker was T. Boek. A round silver alarum repeater-watch, with open side and a silver chain, three seals and two keys attached. The maker was Henry Gelhart à Strasbourg. A round silver watch, with white and blue enamelled dial. The maker was Pierre Duet. A round silver repeater watch, with open gilt sides and a silver ring, with numerals on the dial plate. The maker was Boekelts, Hagh. A round silver watch, chased with flowers, having a silver dial-plate, and two circular dials, showing the hour, the age of the moon, and the days of the week and month. The maker was Louis Arthaud à Lyon. A round silver watch with silver dial and gilt open work. The maker was Heinrich Carstens, Lubeck. A round silver watch, showing the hour and the day of the month.

Messrs. Hunt & Roskell have a gold watch, by Emery, of London, with a painted enamel case of the Holy Family, and a landscape inside. Mr. T. G. Gardner has a gold watch by Richard French, chased with flowers, and a painting on the back, in the Watteau style, of children catching birds. The bezel is set round with diamonds; the bow and bands are also set with diamonds. It has an outer case. Mr. H. W. Sass has an enamelled gold watch by Fitter, of London, with a painted female figure holding a caduceus; at her feet are a cornucopia and flags. Miss Bentinek has a small enamelled gold watch, painted at the back with amorini playing with a goat. The watch, teapot, and punch-bowl of Dr. Samuel Johnson, who died in 1784, are still reverently preserved by their owners from crack or flaw. His inkstand is in the possession of Dr. Robert Rigsby, of Peekham. Lunardi, an *attaché* to the Neapolitan embassy, made the first aerial ascent in England from the Artillery Ground, Finsbury, in September, 1784. Upon which occasion the Prince of Wales, afterwards George IV., presented him with a gold

watch, as a token of his admiration of what appeared at that time to be a most wonderful experiment. In making another ascent from Naples some time afterwards, about 1802, Lunardi fell into the sea, and the watch was much injured. He then petitioned the prince to order it to be repaired. The following is a copy of the petition, the original of which is in the possession of Mr. John Bullock, of Seven-oaks, by whose kindness the author is enabled now to publish a transcript of it. The petition is entirely in the autograph of Lunardi, and was endorsed by him as follows: "To His Royal Highness George Prince of Wales. The most respectful Petition of Vincent Lunardi, first aerial Traveller in England." "To His Royal Highness George Prince of Wales. The most Respectful Petition of Vincent Lunardi. Humbly sheweth, That Your Royal Highness Petitioner soon after his ascent from the Artillery Ground, and Aerial Voyage, receiv'd a valuable Stop-Watch describing seconds, as a token of Your Royal Highness's approbation, with a command that it should be Your Petitioner companion on every future aerial excursions, which has ever been implicitly obeyed. And Your Highness's Petitioner begs leave to represent, that after ascending with His Balloon from Naples he was unfortunately obliged to descend in the Gulf and being dragged, through the waves for three hours, he was landed at the Island of Capri, where on recovering from the fatigue of his unpleasant aquatic journey he found his valuable Watch so much injured by the Salt Water, that the exertions of a very ingenious artist were required to render it once more useful, but in Italy neither Love or money could procure that assistance. Your Royal Highness's Petitioner therefore humbly solicits that Your Highness will be graciously pleased to direct Mr. Villiamy to renew the internal part of the Watch, so that he may enjoy its aid on his next flight, which will shortly take place at Cornua while the British fleet is off Ferrol, and Your Royal Highness's Petitioner will continue, as has been his uniform practice to offer up his prayers, especially when he has ascended nearest Heaven, to Almighty God for the Precious Health and Long Life of Your Royal Highness." This petition was sent by Lunardi to Villiamy, of Pall Mall, the prince's watchmaker, in a letter, of which the following is a copy:—"Mr. Villiamy, His Royal Highness's Prince of Wales Watchmaker, Pall Mall. Mr. Lunardi presents his respectful compliments to Mr. Villiamy, he has been very ill with a colic and seems it will not be in his power not to walk out to Day, therefore as he understand His Royal Highness is to leave Town this afternoon, Mr. L. begs Mr. Villiamy will wait on His Royal Highness with the enclosed. Thursday morning 9 o'clock. No. 13, Oxendon Street, Haymarket."

In 1785 died Peter Roy, who was watchmaker to the King of France. He was the author of the Memoirs for the Clockmakers of Paris, entitled "*Etrennes Chronometriques*." Julien le Roy, a relation of this mechanician, was a famous French watchmaker, of whose reputation his brother artists in Paris were jealous, and they did what they could to imitate him. T. B. Baillon, the queen's horologist, tried to outdo him, and he made all sorts of whimsical clocks and watches, adding toys to them, as the fashions of the court required change. This man died young, and probably the richest clock and watchmaker in Europe.

Sir Richard Phillips tells us in his "Chronology" that, in 1787, a shark was taken in the Thames near Poplar, and in its belly was found a watch, with the name of Watson engraved upon it. It belonged to a young gentleman who had been drowned near Falmouth.

In Colman's opera of "Inkle and Yarico," first played in 1787, Sir Christopher Curry sings:—

"Complaisance is a gingerbread creature,
Us'd for shew, like a watch, by each spark;
But truth is a golden repeater,
That sets a man right in the dark."

The "Annual Register" for 1777, the *Gentleman's Magazine* for the same year, and Sir Richard Phillips, in his "Chronology," record that in December, 1777, was tried before Lord Mansfield in the Court of King's Bench, a remarkable case, the first of its kind, "Cabrier against Anderson," in which the defendant was sued for putting the plaintiff's name to five watches made by the defendant, and thereby hurting the reputation of the plaintiff. A verdict was given for 100*l.*, being 20*l.* for each watch, agreeable to an Act of Parliament by William III., inflicting a penalty on watchmakers who put fictitious names on their watches.

Jean Jacques Rousseau, who died in 1778, in his "*Emile*" livre III., thus moralises upon "*la montre du sage*"—"Le temps perd pour nous sa mesure, quand nos passions veulent regler son cours à leur gré. La montre du sage est l'égalité d'humeur, et la pail de l'ame; il est toujours à son peure, et il la connoit toujours." Rousseau's copper watch was sold in Paris after his death for 500 francs.

To be continued.

GOLD.

(Continued from page 127).

THOUGH gold was from time immemorial discovered in nearly all lands, yet so comparatively small was the quantity found, that in reckoning the *average* produce of all parts of the New and Old World previous to 1847 it did not amount to the *annual* value of 5,000,000*l.* sterling. In that year, however, the first of a series of discoveries was made, which led to a vast increase in the supply of gold, and to a complete reversal of old ideas respecting the prospects of the gold seeker. We refer to its discovery in California, Australia, and South Africa.

Twenty-two years later, in 1869, the total value produced was computed at 60,000,000*l.*, one-fourth of this representing the value of the production of California. The value of the joint production of the Australian Colonies was a little above another one-fourth.

Gold is always found in the metallic state; it is usually either disseminated through the rocks, often in extreme minuteness, or spread out in thin plates or grains on their surface, or implanted in their cavities under the shape of filaments, or arborescent crystalization; some of it, however, is found in pieces of considerable size, called in America "pepitas," in Australia "nuggets." Humboldt states that the largest "pepita" known in his time was one found in Peru, weighing about 26½ pounds avoirdupois, but masses have been found in the province of Quito weighing four times as much, and some of the Australian "nuggets" have also greatly exceeded this.

Mr. J. Arthur Phillips, in his work on "The Mining and Metallurgy of Gold and Silver," gives the following modes of occurrence of gold:—

Native gold.—An alloy of gold and silver, associated with small quantities of copper, iron, and other metals.

Palladium gold.—Gold, palladium, and porpezite.

Rhodium gold.—Gold and rhodium.

Gold amalgam.—A native amalgam of gold and mercury.

Sylvanite, or graphic tellurium.—An ore, being a telluride of gold and silver.

Nagazgite.—An ore, telluride of lead, containing gold, silver, and copper.

Gold is also found associated with copper and iron pyrites, whether chemically or mechanically, does not appear certainly known.

Native gold is almost always associated with silver.

The mineral formations in which this metal occurs, are the crystalline primitive rocks, the compact transition rocks, the trachytic and trap rocks, and alluvial grounds.

Wherever gold occurs its origin can generally be traced to quartz veins in the primary or volcanic rocks, such as granite, gneiss, porphyry, clayslate or greenstone. As these rocks become decomposed by the action of the weather, portions of the auriferous veins are carried down by streams and floods, and so find their way into the deposits of sand, clay, and shingle in river-beds, and in the gullies and flats of hills. Many of these golden drifts are of great thickness, formed by the long continued wasting of the neighbouring rocks, and therefore require mining to a great depth.

The "Trachytic," which in some districts form the principal portions of the rocks, including gold, are regarded as of igneous or volcanic origin.

The late Sir Roderick Murchison says in a chapter on the original formation of gold in his "Siluria":—"We may first proceed to consider the nature and limits of the rich gold-bearing rocks, and then offer proofs that the *chief* auriferous wealth, as derived from them, occurs in *superficial detritus*. Appealing to the structure of the different mountains, which at former periods have afforded or still afford any notable amount of gold, *we find in all a general agreement*. Whether, referring to past history, we cast our eyes to the countries watered by the sources of the golden Tagus, to the Phrygia and Thrace of the Greeks and Romans, to the Bohemia of the middle ages, to tracts in Britain, which were worked in old times and are now either abandoned or very slightly productive, or to those chains in America and Australia, which previously unsearched have in our times proved so rich *we invariably find the same constants in nature*. In *all* these lands gold has been imparted abundantly to the *ancient rocks only*, whose order and succession we have traced, or their associated *eruptive* rocks. Sometimes, however, it is also shown to be diffused through the body of such rocks, whether of igneous or aqueous origin. The stratified rocks of the highest antiquity, such as the oldest gneiss and quartz rocks (like those, for example, of Scandinavia and the Northern Highlands of Scotland), have *very seldom borne gold*, but the sedimentary accumulations which followed, or the Silurian, Devonian, and Carboniferous (particularly the first

of these three) have been the deposits, which, in the tracts where they have undergone a metamorphosis, or change of structure by the influence of igneous agency, or other causes, have been the chief sources whence gold has been derived."

It appears that gold occurs only where the Silurian rocks have been disturbed, or broken through by *eruptive* forces. In Russia, for example, gold is not found in the *level* Silurian rocks, underlying vast plains, but it is visible wherever those beds have been broken through, as in the Ural Mountains. The granite, or quartz, is the great matrix, and exists in veins or reefs, varying from a few inches to 50 feet in thickness, and of great length and breadth. The gold is generally distributed along the line of eruption, but is most plentiful at the junction of the Silurian rock with the granite or quartz reef. Besides gold, there are found many sulphurets, as copper pyrites, iron pyrites, arsenical pyrites, and such as occur in other mining districts situated in the same class of rocks.

From this it would seem that there is some connection between the formation of gold and volcanic agency; also, that it is in the power of the geologist to predict, with a certain degree of accuracy, the sources whence gold may be derived.

In corroboration of this, we may affirm that the merit of pointing out that gold might probably be found in Australia (long before its existence there was known in Europe) is due to Sir Roderick Murchison. His words are as follows:—

"Having, in the year 1844, returned from the auriferous Ural Mountains, I had the advantage of examining the numerous specimens collected by my friend Count Strzelecki along the eastern chain of Australia. Seeing the great similarity of the rocks of these two distant countries, I could have little difficulty in drawing a parallel between them, in doing which I was naturally struck by the circumstance that *no* gold had yet been found in the Australian range, which I termed in anticipation, the 'Cordillera,' impressed with the conviction that gold would, sooner or later, be found in the great British colony. I learnt in 1846, with great satisfaction, that a specimen of the ore had been discovered, I thereupon encouraged the unemployed miners of Cornwall to emigrate, and dig for gold, as they dug for tin in the gravel of their own district. These notices were, as far as I know, the first *printed* documents relating to Australian gold."

Mr. J. Arthur Phillips gives the following interesting facts relative to the discovery of gold in Australia:—

"The first official notification of the discovery of gold is contained in a despatch from Governor Fitzroy to Earl Grey, and bears date May 22nd, 1851. In this it is announced that a gold field had been discovered westward from the town of Bathurst, and at a distance of about 150 miles from Sydney; his excellency at the same time states his suspicions that the specimens sent for inspection might be the produce of California, and that both the nature and value of the discovery had been much exaggerated. These accounts were however deemed of sufficient importance to warrant the stationing of a strong police force in the road leading from Bathurst to the capital."

On the 19th of May, Mr. Stutchbury, the geological surveyor, wrote from Summer Hill Creek, that gold had been obtained in considerable quantities in that locality, and that with no better apparatus than an ordinary tin basin, from one to two ounces per day were readily obtained by each washer. He also adds that 400 persons were busily at work at the time of his visit, and that the gold was not only found in the creek itself, but also at various points, so as to leave no doubt as to its existence over a considerable tract of country. This camp of the gold finders was called the city of Ophir, and to it flocked vast numbers, eager to obtain their share of its golden treasures. The existence of gold among the various mountain chains of New South Wales had not only been predicted by Sir Roderick Murchison, but had also been insisted on by Mr. Clarke, a native geologist, who expressed his conviction that the Blue mountains would at some time prove to be auriferous. These views were to a certain extent confirmed by the circumstance of a shepherd having long been in the habit of bringing into Sydney for sale fragments of native gold, but refusing to state whence he had obtained them.

About two years before the actual discovery of gold in the colony, a Mr. Smith, who was engaged in some iron works in the vicinity of Berrima, produced to the Colonial Secretary a lump of gold imbedded in quartz, which he said he had picked up in a place which he offered to make known to the Government on being previously rewarded for the intelligence by the payment of a considerable sum. The reply to this offer was, that no blind bargain upon such a subject could be entered into, but that if Mr. Smith thought proper to trust to the liberality of the Government, he might rely on being rewarded, in proportion to

the value of the alleged discovery, when that had been ascertained.

To the conditions of this proposal Mr. Smith refused to accede, and here, for a considerable time, the matter rested, as, apart from the suspicion entertained by the governor, that the piece of gold produced by Mr. Smith, might have come from California or some other foreign locality, he was of opinion that any investigation instituted by the Government, with a view of ascertaining whether gold did in reality exist to any amount in that part of the colony, which, from its geological formation, might be supposed to afford it, would be liable to agitate the public mind to such an extent, as to divert the attention of the colonists from their proper and more certain avocations.

On the 3rd of April, 1851, Mr. Hargraves, who had recently returned from California, addressed a letter to the Colonial Secretary, to the effect that, having occupied himself for two months in exploring a considerable extent of country, in which, from his experience in California, he was led to believe gold was to be found, he had prosecuted his speculation to a successful issue, and offered to point out to the officers of Government the localities in which he had discovered gold, on condition that he should receive the sum of five hundred pounds as a compensation. To this proposal, a reply was returned similar to that given on a former occasion to Mr. Smith, and on the 30th of April Mr. Hargraves addressed a second letter to the Colonial Secretary, expressing his willingness to leave the remuneration of his discovery to the liberal consideration of the Government, and naming the localities from which he had obtained specimens of gold.

On the 8th of May the discovery became generally known, as some persons, who had been employed under the directions of Mr. Hargraves at Summer Hill Creek, one of the localities named by him as auriferous, had obtained several ounces of gold; and on May the 13th, very great excitement prevailed from a report that a solid piece of gold, weighing 13 oz. had been obtained. This on inquiry, proved to be correct, and hundreds immediately started for the diggings.

The Government now issued a proclamation, declaring that all persons digging for gold without a license would be proceeded against; and regulations were issued, authorizing the Crown Commissioners to grant such licenses for a fee of £1 10s. per month. The Commissioners were also furnished with a force of ten men for the purpose of collecting these fees, and with the maintenance of order; strong detachments of police being at the same time posted along the principal roads leading to the gold fields. Mr. Hargraves, and the Government geological Surveyor, Mr. Stutchbury, with whom Mr. Clark was afterwards associated, were now ordered to make an immediate survey of the various localities in which it was thought that gold would be found.

As might be expected, the excitement spread rapidly, and large numbers of persons left their employments, and flocked to the spot. On the 19th of May, 400 persons were reported to be occupied at the diggings at Summer Hill Creek. On the 29th, 1000, and on the 5th of June 1500 were stated to be thus employed. About the 14th of June a fresh enterprize was opened on the Turon River, one of the localities first pointed out by Mr. Hargraves, and afterwards more specifically indicated by Mr. Stutchbury. This at once carried off a large number of those previously employed at Summer Hill Creek, or Ophir, as that locality is now called, since early in July it was stated as probable that at this place the number of diggers for the month would not exceed 400, while at Turon it would be considerably above 1000. In December the number of diggers on the Turon amounted to 6000, the production of gold there being said to have been "as regular as wheat in a sown field."

A short time after the announcement of the existence of gold in the colony of New South Wales Proper, a still more amazing discovery was made in Victoria. In a despatch dated 25th of August, 1851, Lieutenant-Governor Latrobe communicated to Earl Grey that large auriferous deposits had been found in that colony. The three localities first-named were Clune's Diggings, about forty miles from Melbourne, where the gold was found in an alluvial deposit, consisting of quartz gravel; at Boninyong, or Ballarat, situated on the river Leigh, about seventy-five miles from Melbourne, and forty-five from Geelong, where the gold was sometimes imbedded in compact quartz; and at Deep Creek, only nineteen miles from the capital, where the precious metal was found to exist in connection with slate rock. At Ballarat, from whence the greatest quantity of gold was obtained, the metal is found in lumps of various sizes—sometimes in the superficial soil, but more generally scattered through three or four

successive strata, principally composed of clay and gravel, and occupying from 10 to 30 feet in depth. The richest deposits are, however, found in certain small beds of blue clay, 4 or 5 inches in thickness, and lying almost immediately above a stratum of pipeclay, in and below which no gold has been found. In addition to the above localities gold was also found near Geelong, at Mount Disappointment, in the Pyrenees, and finally the people of Melbourne began to break up the streets, which were macadamized with quartz pebbles obtained from the gold districts. By this time Melbourne and Geelong were almost emptied of their male inhabitants. The shopmen and day-labourers were the first to leave, and the superior class of farmers and tradesmen speedily followed, partly from sharing the same mania, and partly because, after losing their subordinates, they could do nothing else. In some cases they placed themselves at the head of digging parties, consisting of their dependents; and in others worked singly and with their own hands. At this time the public excitement became so great that it was found impossible to retain the services of the government *employés* without an addition to their salaries of first 25, and subsequently 50 per cent. In about a month after this a fresh gold field was discovered in the range of Mount Alexander, on the east of the Loddon River, and about seventy miles north-west of Melbourne, which shortly surpassed in richness not only the Ballarat diggings, but all others which had been previously discovered.

The whole structure of Australian society now become completely disorganized. The number of diggers at Ballarat, which had previously risen to 6000, were quickly reduced to about 1600, whilst the number at Mount Alexander soon amounted to 20,000. From this time gold began to be collected from all the various streams flowing from the Mount Alexander range on the Goulburn River, and the supply was so far increased that gold soon arrived at the seaport at the rate of two tons per week. This was in 1851, and since then many other localities have been discovered. We thus find that the search for gold cannot be wholly regarded as a species of lottery, in which there are more blanks than prizes; as much of its speculative character may be removed by a knowledge of geology, and of the various processes of mining and metallurgy.

The "general agreement" of the gold bearing rocks, referred to by Sir Roderick Murchison, is further borne out by their similarity, and apparent connection in America, Australia, and Asia.

Glancing at a map of the world we find, that throughout the greater part of America, from Behring's Strait in the north, to Cape Horn in the south, there stretches a stupendous chain of mountains, which at one part abuts against the waters of the Pacific, at another is apparently buried beneath them (its general line being marked out by a string of islands,) and at others, again, its culminating points are situated far inland. Now, along the eastern slopes of this chain of mountains, gold mining has been carried on for centuries; in Chili, Bolivia, Peru, Ecuador, New Granada, and Mexico, and, more recently, in California, Oregon, Washington, and British Columbia. There is no reason to doubt the existence of gold along the greater part of the western side of America, and it is believed that the great mountainous ridge of America once had a sea slope, everywhere as broad as that now existing between Vancouver's Island and the Rocky Mountains; *granite* forms the axis of this elevation, and *granite* is the rock, of which the islands, from Vancouver's Island and the Sea of Kamschatka are composed, and in all these *gold has been found*. Off California the sea constantly washes up a bluish sand, like the pipeclay of Ballarat, and like it, *abounding in gold*. On crossing the Pacific we can trace the line of a *similar granitic* elevated axis, through Australia, into New Guinea, and the direction of the range may be conjecturally sketched, through the Caroline and other islands, to Japan, and from this point by the Kurile Isles, to Kamschatka, and so to the great chain of America. Along this line, too, gold is extensively worked. The abundance of the metal along the Western shores of Australia is well known. Recently the operations of the gold miner have extended to New Zealand. New Guinea is known to be auriferous, as are also the Celebes, Siam, Cochin China, and Japan, while the north-west and south-east provinces of China are possessed of diggings on an extensive scale. This auriferous belt, surrounding the basin of the Pacific, is also found to correspond in situation with a belt of volcanoes. Humboldt found that 198, out of the 225 volcanoes known to him, were situated in this belt. This remarkable coincidence seems also to confirm our theory that there is some connection, between the formation of gold, and the action of volcanoes.

To be Continued.

IMPORTANT AND VALUABLE DISCOVERIES OF TREASURES.

THE SCHLIEMANN DISCOVERIES.

DR. SCHLIEMANN continues his labours under a lucky star, and the researches which he is so ardently making are signally crowned with success. The discoveries at Mycenæ are truly great, and tend largely to further our knowledge of the Ancients. The progress of his excavations led him up to the ancient tombs on the Acropolis, and in the great circle of parallel slabs beneath the Archaic sepulchral stones, considered by Pausanias, following tradition, as the tombs of Atreus, Agamemnon, Cassandra and Enrymedon an immense quantity of jewellery presented itself to the astonished eyes of Dr. Schliemann. It is impossible at a first glance to describe the rich variety of the treasure, and before we present to our readers the very interesting account of the celebrated discoverer, we shall sum-up as near as possible the details of the jewellery. In a portion of a tomb, human bones, male and female were found, together with plate, jewellery of pure Archaic gold, weighing 5 kilogrammes, two sceptres with heads, crystal and chased objects in silver and bronze. Immediately after commencing excavations at an adjoining tomb a large head of a cow in silver with immense horns of pure gold was found, and not far from it a large girdle of gold, five gold vases, an immense number of golden buttons, numerous swords of bronze, all marvellously worked, but no trace of iron-work. In the last tomb there were also a breast-plate, mask and baldric, all of gold. The masks seem to be the portraits of the deceased. Further a helmet, two diadems, a woman's large comb, six vases, two bracelets, two rings, three brooches, leaves and other objects of similar nature. Neither were axes, warriors knives and arrows wanting; of the latter twenty-five were found with flint-heads.

The following extracts from letters of Dr. Schliemann, dated Mycenæ, the 15th and 16th of November, are of interest:—

"I found below the three sculptured tombstones, of which I sent you the drawings, a square tomb 26½ feet long and 11½ feet broad. The depth of it I cannot yet determine, as it has not been entirely emptied. It certainly exceeds 14½ feet below the surface of the rock and 53 feet below the surface of the Acropolis, as it was when I began my excavations there. The tomb borders on the wall which supports the double circular parallel rows of tombstones; nay, the wall goes through the N. W. angle of the tomb. This fixes their relative age. When that wall was being built the old tomb was evidently emptied, and I found in it only thirteen gold buttons (one of them as large as a five franc piece), with splendidly engraved spiral lines, and with the sign which some archæologists call the Svastika or Arani, from its similarity with the Indian symbols of that name. There was a mass of gold blades with impressed circles or spiral ornaments, but nothing *in situ*, and scattered about at intervals of 3 feet and 6 feet.

"In the second row of sculptured tombstones I found beneath two slabs a square ditch 11½ feet broad, 21 feet long, and cut 14½ feet deep into the rock. Its bottom reaches, therefore, to 30 feet below the surface of the mount. Around the four sides of the tomb is a Cyclopean wall 5 feet high and 2 feet thick. It contained bodies reposing on the rock. They had evidently been burnt, the bones were embedded in black ashes and covered with a layer of large stones. It is impossible as yet to determine the number of bodies contained in this tomb. The bones of one person dug up at the south corner were covered with five immense gold leaves—the first leaf, 47 centimetres long and 10 broad; the second, 47½ centimetres long and 6½ broad; the third, 55 centimetres long and 6½ broad; the fourth, 63 centimetres long and 6½ broad; and the fifth, 63 centimetres long and 6½ broad. Upon these gold leaves were found five crosses, each 18 centimetres long and 4 centimetres broad, and formed each of four gold leaves. There were, besides, four gold blades of circular form—one 8, the other 5½, and the third 2½ centimetres in diameter—and numerous ornaments which I cannot here describe.

"I have now begun to dig up the tomb beneath the stone with the bas-relief of the two serpents, and another beneath two un-sculptured stones in the second row. There are more such tombs in the large circle of the double parallel row. I shall not leave Mycenæ till I have examined them all.

"As the wall with the circular rows of slabs passes through part of the first tomb, and as the second tomb, which was undisturbed, contains only more ancient hand-made pottery, it seems clear that these tombs are far more ancient than the double parallel rows of slabs, which were probably erected in

honour of the heroes who, as tradition has it, lay buried in those immense square tombs.

"The Treasury has given me immense trouble, and though I have been working at it for more than two months with a large number of labourers and carts, it is still far from being entirely cleared out. The centre of it is clear down to the virgin soil, and likewise the threshold. Nothing of particular interest has as yet been found there."

On the 17th of November Dr. Schliemann writes:—

"I hasten to inform you that in the same tomb were found the calcined remains of two more bodies, each with precisely the same number of gold leaves, round blades, and crosses. All these objects have the same beautiful ornamentation of spiral lines and circles. In a day or two I shall know how many more tombs there are. I am now clearing the whole circle down to the rock."

We shall continue to keep our readers *au fait* with all that transpires relative to the discovery.

THE CESNOLA DISCOVERIES.

AN interesting and valuable *trouvaille* has recently been offered to the trustees of the British Museum; and, subject to the report of Dr. Birch, keeper of the Department of Oriental Antiquities, and of Mr. Newton, of a section of the Antiquity and Ethnography Department, it is likely to become the property of the nation. The intrinsic value of the gold alone, contained in this collection, has been estimated at 12,000*l.*; and when we state that the fortunate discoverer of this treasure, General di Cesnola, is willing to dispose of it for this truly inadequate amount, we cannot but express the hope that no time will be lost in securing the possession of this important collection.

The history of this discovery (to which we may hereafter advert) is of the most interesting and romantic character; displaying at once the perceptive genius, and the resolute activity of the fortunate explorer, who, while making researches for antiquities in a district of the island of Cyprus, was led by certain inductions to make excavations, and ultimately to penetrate into a succession of chambers wherein, to his pleased astonishment, this mass of treasures was revealed to his gladdened gaze.

When we state that this collection contains no fewer than 1505 articles, mostly in the precious metals or valuable gems, and chiefly of elaborate and artistic design and workmanship, the advantage that it offers to modern art cannot fail to be appreciated; and when, which we trust will speedily be the case, its possession is realized, we shall not fail to refer to it in detail. For the present, we must be content with noticing, as some indication of its immense worth, that in the first discovered chamber were found 550 objects of gold and gems, consisting of diadems, or portions of diadems, and perfect rings, earrings, bracelets, necklets, large solid coiled armlets, some being nearly as thick as one's little finger, and golden leaves; also a gold cup, 5½ inches in diameter, and more than 2 inches deep, solid, beautifully decorated with a pattern of Egyptian work in lines of lotus in *repoussée*, finished on the inside with a tool. The rings comprise signets of gems, engraved, in many cases, with art of the highest order, and all being in perfect condition. A very considerable portion of the gems are scarabei of fine workmanship, and easily recognizable origin; some of them bear Greek letters, others Egyptian or Assyrian characters. Some of the intagli are of the loveliest style; among these we may notice an archaic Greek one representing Pluto and Proserpine. This, one authority has declared to be the finest example of its order in existence. There are other gems designed and sculptured with wonderful spirit. The materials are agate, onyx, carnelian, jasper, sard. This large discovery of engraved ancient gems is likely to throw an unexpected light on the history of the glyptic art.

Some of the gold ornaments are of hardly inferior value in history and art to the gems. Among these, several are declared equal to the best Etruscan examples in design and execution. This class of relics includes objects, probably fibulæ, which are enriched with superbly wrought Chimaeræ, rosettes, and other decorations of Greek fashion, but subject to a decided and obvious Assyrian influence. Some are of solid gold, some of silver upon gold, some of gold upon silver, some of gold on bronze; a few are of hollow gold. Some comprise enamels in the fittings in of the petals of flowers, and the eyes of the Chimaeræ; this material is also found similarly employed in certain articles of bronze, found in one of the other chambers. The only articles, not wholly of gold which occurred in this first chamber, were three beautiful rock crystal amphoræ, mounted in gold; a very large signet ring or stamp, and

three other rings of the same material; a necklace of rock crystal beads, alternating with golden ones, and having a pendant of rock crystal, shaped like a bottle.

In the second room, the objects, 280 in number, were all of silver. This large discovery of works in that metal is of the highest antiquarian importance, for, owing to the perishable nature of silver, works formed of it are extremely rare. This find is also, as no doubt some of our own artizans will confess, especially noteworthy for the number of its examples, the beauty of the art employed on many of them, the fine condition of some, and the peculiar circumstance of the case. The more important specimens consist of about thirty vases, pateræ, cups and vessels of other forms; some of these are so much oxydized that they crumble to the touch, others distinctly retain the brilliancy of the metal and its whiteness. Some of the relics are enriched in *repoussée*, and other modes of decoration. There are more than sixty bracelets; most of these terminate in heads of asps, as in Egyptian works of this order, which they closely resemble. Some of these armlets are more than a pound in weight, and the whole comprises every variety, whether for the use of men, women, or children. There are also amulets, earrings, fibulae and spoons; besides two beautiful belts enriched with gold, and ornamented in an Assyrian mode; one of these seems to have been woven in silver wire, and was probably flexible. There are in addition many fragments massed by oxydation. Among the most important specimens are two large pateræ in a wonderful state of preservation; each having a central boss, which is enclosed by a flat ring, both boss and ring being of gold incrustated on the silver body of the vessel, the ring being decorated with lotus and palm leaves, and other subjects frequent in Egyptian and Assyrian art, and in this case showing a combination of the modes of design adopted by each nation.

In the third room were discovered terra-cottas, vases, alabastra, &c. In the fourth room more than 500 bronze or copper vessels, and numerous other articles of interest; but which, not being so immediately important to our readers, we do not here detail, though very suggestive in their varieties.

Suffice it to say, that this discovery may be considered as almost marvellous in itself, that its treasures are all of undoubted antiquity, combining, as we have stated, intrinsic value with extrinsic worth of multiplied extent; and we are sure that all our readers will re-echo with ourselves, when we repeat the hope that no time will be lost in at once securing to the nation so inestimable an acquisition.

Since compiling the above, we learn that many of the articles alluded to have been exhibited in cases at the Museum; there is consequently great hope that the collection either has been or will be purchased by that Institution.

THE DIAMOND LIGHT.

AN important invention has recently been patented under the name of the Diamond Light, and having had one of these burning in our office for the past week or two, we are in a position to lay its merits before our readers, and may remark that the lamp has just been awarded the first prize by a jury of scientific men, after close competition with all other flat wick lamps of previous and different construction. By the use of an automatic, simple, and very effective mechanical contrivance, which forms a part of the lamp, and is completely hidden from view, the most perfect combustion is attained without the use of any glass chimney, and a wick five-eighths of an inch broad gives a greater light than a wick 1 inch broad does in the lamps where chimneys are used. The Diamond Light lamp burns as brightly and as freely as gas, affording a light of a more economical kind (the mere saving per hour being about two-thirds for the same amount of light against the equivalent in gas). The colour of the light is less trying to the sight. The adaptability of such a lamp, especially in various workshops, and to the varied sections of the watchmaking and jewellery trades, as well as to manufacturers in general, will be a great boon, as it is applicable to every purpose of artificial illumination. Messrs. Starr & Co., of 41, Moorgate Street, London, will afford any further information that may be required, and one of the lamps may be seen burning at their office.

WATCH AND CLOCKMAKERS' ASYLUM.

THE annual festival of the subscribers and friends of this institution was held in the Forester's Hall, Wilderness Row, on Saturday, October 18th, under the presidency of Mr. Thomas Collier, chairman of the committee. In proposing the health of the chairman, the treasurer, Mr. C. ROWLANDS, stated that the Asylum had been established 23 years, giving a comfortable home and a pension of 20*l.* a year to indigent members of the trade unable to sustain themselves by their own exertions.

ROYAL ASTRONOMICAL SOCIETY.

THE first meeting after the long vacation was held at the Society's Rooms, Burlington House, on Friday, the 10th November; Wm. Huggins, Esq., President, in the chair.

George Speeding Almond, Esq., of Daisy-hill, Dewsbury; Josiah Owen Corrie, Esq., B.A., of Red Cot, Putney Park-lane; Captain Joseph Leeman, of Aberdeen; and Herbert Sadler, Esq., of Honiton Rectory, Devonshire, were elected fellows of the society.

A hundred and thirty-three presents were announced as having been received during the long vacation, amongst which Mr. Raynard drew particular attention to a very valuable complete set of the transactions and proceedings of the Finnish Academy, which had been presented to the society by Prof. Krueger.

The Astronomer Royal said that he had usually, at the first meeting after the long vacation, given some account of the proceedings of the Royal Observatory during the recess. In the present instance there was little that was new to report upon, but he wished to draw attention to the surprising regularity with which the moon had been observed, especially during that severe part of the lunation which we know as the old moon or the morning moon. Physical observations had also been assiduously prosecuted under the special direction of his chief assistant, Mr. Christie. Solar photographs had been regularly taken, and much attention had been bestowed upon the important branch of spectroscopy, in which Mr. Huggins had first led the way. A careful series of measurements had been made of the displacement of the lines in stellar spectra and in the spectra of the planets, and he was happy to say that in most respects the important cosmical deductions which had been arrived at by the president had been confirmed. There was also another subject to which he had personally given a great deal of attention. The society would remember that he was engaged upon a novel form of lunar theory; he had, with the aid of assistants, brought a part of the work to a state in which it could be printed. He showed some of the sheets to the meeting, and explained the manner in which the co-efficient had been obtained.

Mr. Dunkin read a paper by Professor Langley, of the Allegheny Observatory, Pennsylvania, entitled "Measurements of the Direct Effects of Sunspots on Terrestrial Climates."

Mr. Penrose read a paper entitled "An endeavour to simplify the method of making the correction for the spheroidal figure of the earth in lunar observations, and particularly with reference to the effect upon the lunar disease."

Mr. Christie described some observations which he had made with his polarising photometer upon the relative brightness of different parts of the disc of Venus.

ROYAL MICROSCOPICAL SOCIETY.

AT a meeting of the above society on October 4th, 1876, H. C. Sorby, Esq., President, in the chair, a paper by Mr. Thomas Palmer was read, "On a New Method of Measuring and Recording Bands in Spectra." A paper "On the Microscopical Structure of Amber," by Mr. H. C. Sorby and P. J. Butler, was read by the president. A paper by Dr. Hinds, "On a Curious Effect in Connection with the Cells in the Leaves of *Hypericum Androcæmum*," was, owing to the lateness of the hour, taken as read. A prepared section of "Brighton Pebble" was exhibited by Mr. Slack. Mr. Frederick Kitton, of Norwich, was elected an honorary fellow of the society.

MONSTER CLOCK.

ANOTHER wonder has been added to that wonder in itself the Crystal Palace, in the shape of a monster clock. Six months labour have brought about its erection in the south end of the building. Nearly a fac-simile of the Westminster Clock with the exception of the striking and chiming apparatus, it has the largest dial ever made, having a diameter of 40 feet, or about 1300 square feet in area. The hands with their counterpoises weigh a quarter of a ton; the minute hand measures 19 feet in length, moves half an inch at every pendulum-beat, and its point travels four miles a week. The variation was only eight seconds in seventeen days. The monster clock was manufactured and erected by Messrs. E. Dent & Co. of the Strand and Royal Exchange.

MIRROR OF THE MONTH.

DECEMBER.

DECEMBER derives its name from the Latin word *decem*, ten. It was so called from the place it held in the Roman calendar, it having been the tenth month of their year. The Romans began their reckoning in March, and ended with February. Our Saxon ancestors called it *Winter Monath* (*Winter Month*), until they embraced the Christian faith, when, in devotion to the birth-time of our Saviour, they reverently called December, *Heligh Monath*, or Holy month. The name of this month was given by Julius Cæsar, hence it is sometimes called the tenth month of the Julian year.

On the 22nd of this month the sun enters the sign Capricornus; the day preceding is the shortest in the year. This month is, as the immortal Shakspeare calls it, "*dark December*," and the epithet is fully justified by the drizzling rains, the cloudy days, the cold the mists, and the storms of sleet and snow which now prevail. Winter now takes dominion of all the northern hemisphere; and in all the more northern latitudes the weather is extremely cold, bleak, and gloomy; and, in general, presents no other variety than such as is afforded by a succession of storms and tempests; and, instead of radiant skies, verdant groves, and variegated meadows, we have only a frowning, inclement atmosphere, dreary wastes, and leafless trees. The frost seldom becomes settled till the latter end of the month. This is considered the most unpleasant month of the year. It is sometimes called the *Crumal season*, from the circumstance of the *Crumalia*, or feasts in honour of Bacchus, as tutelary deity of the Ammonites, being held at this time, whose apotheosis was celebrated on account of his being the first cultivator of vines, and inventor of making wine from the juice of the grape, hence some think him to have been Noah.

The *Saturnalia** of the ancients were held in this month. They were instituted before the foundations of Rome, in commemoration of the freedom and equality which prevailed on earth in the golden reign of Saturn. Indeed, the festivals in honour of Saturn have been held from time immemorial, and our customs of Christmas gambols, feasting, and merriment, are relics of that heathen custom which, among many others, remained to be observed among the people, notwithstanding the ascendancy of Christianity in Europe. Saturn, or Time, was the inventor of husbandry, or agriculture; hence he was said to be the son of *Coelum* and *Terra*; which, as the latter brings forth through the influence of the former, was an appropriate title for *Time*, which brings everything to maturity, and also to decay: for this reason it was that Saturn was accused of devouring his own children.

Lucretius makes a jest of this idea, with respect to the Phrygians, who first sowed corn, and probably among whom the feasts of the Saturnalia were first celebrated. The reign of Saturn, by the wisdom and mildness of his government, is said to have produced the "*golden age*." Might not this designation have arisen from the golden colour of the yellow ears of ripe corn? Mr. Creech, in his translation of Lucretius, describes the Saturnalia as a season of outrageous mirths, bordering on madness:

"Here some in arms dance round among the crowd,
Look dreadful gay in their own sparkling blood;
By dancing quick they make a greater sound,
And beat their armour as they prance around,
Lest Saturn should observe and eat the boy,
And Ops, for ever mourn her prattling joy."

Our Saxon ancestors kept this season with greater hilarity, and throughout many centuries, since the Christian era, it has been constantly celebrated with much gaiety, some splendour, and full of superstition, but now vanishing away before the light of Knowledge.

Among the heats of the Revolution, the French Convention in October, 1793, adopted a set of names for the months somewhat like that kept up in Holland, their name for December being "*Nivose*," or snow-month, and lasting from December 21 to January 21. From November 21st to December 21st, the term, "*Frimaire*," or frosty-month, was general; and well have these months merited such appellations.

Interesting for us is that passage in which, after a variety of misadventures in the household on account of the great cold, we read "how, even in church, matters, did not mend, and that they could not await the end of the parson's sermon, which had to last still through three

parts of the hour-glass." For it was in this month towards the end of the sixteenth century that pulpit hour-glasses were more generally used. However invaluable sundials might be as chronometers they could only be of use in daylight and when the sun was actually shining. Some mode had to be devised, therefore, for supplying their place in cloudy weather, at night or within doors, and in our case, for instance, in a dark church on a dark afternoon. One contrivance employed was the clepsydra or water-clock, which noted the passing of time by the escape of water through a vessel, with a hole at the bottom into a cistern beneath. Another method, designed on a similar principle, was that of the hour-glass, by which the lapse of time was ascertained through the passing of a small quantity of sand from the upper to the lower part of the glass. The mode above mentioned of employing hour-glasses seems to have been chiefly introduced after the Reformation, when long sermons came much into fashion. In some degree to regulate too enthusiastic talkers, hour-glasses were placed upon the desks of their pulpits. L'Estrange tells an amusing story of a parish clerk who had sat patiently under a preacher "till he was three-quarters through his second glass" and the auditory had slowly withdrawn, tired out by his prosing; the clerk then arose at a convenient pause in the sermon, and calmly requested "when he had done, if he would please close the church door, and push the key under it, as he himself and the few that remained were about to retire." In the sixteenth century pulpits began to be regularly furnished with iron-work stands for the reception of the hour-glass. Clockwork finds its way through everything, and we find even for the ringing out of the old year—a period now drawing to its close—a clockwork machinery furnished for a church in Wilts, but the Annals of that county say, "it did nought good and would not act." And to the community at large the passing away of the Old Year and the arrival of his successor is heralded by the peal of bells, which, after twelve o'clock has struck, burst forth from every steeple, warning us that another year has commenced. At such a moment painful reflections will often obtrude themselves, of time mispent and opportunities neglected, of the fleeting nature of human existence and enjoyment, and that ere many more years have elapsed, our joys and sorrows, our hopes and forebodings will all along with ourselves have become things of the past. Such is the dark side of the question, but it has also its sunny side and its silver lining:

"For hope shall brighten days to come
And memory gild the past."

BOOK NOTICES.

GOLD: or *Legal Regulations for the Standard of Gold and Silver Wares in Different Countries of the World.*

THIS book is from the press of Messrs. Chatto and Windus Piccadilly, and is an abridged translation from the original German larger work of Arthur Von Studnitz. The translator is Mr. Brewer; and Mr. E. Streeter has supplied "Notes and Additions, one of the latter being the preface. We have seven parts, comprising 139 pp. of solid paper and excellent printing. There is an "Introduction" of several pages, followed by "The Laws of all Countries of the World concerning the Standard of Gold and Silver Wares. Besides dealing with the general question from an argumentative point of view there are several tables showing at a view the standards of the various countries, and the value in carats and grains from 24dwt. down to 1grain. There is a great deal of information compressed into a small space, and the book is one that will be found both interesting and useful to all the three trades represented in this journal. We cannot do more than recommend strongly, especially at the price is a mere trifle for such a collection of facts.

A VERY useful Price List of watch-tools and materials combining completeness and interesting matter has just been issued by Messrs. Swinden & Sons, 27, Temple Street, Birmingham.

THE HOROLOGICAL JOURNAL states that it has been decided to establish a Horological School at Glashütte, Saxony.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 7d. to 4s. 8d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 9d.

* *Saturnalia*, festivals or feasts.

§ Ops, called also Rhea and Cybele, meaning the earth, and worshipped by the ancient Romans as a goddess and wife of Saturn. Ops, or the earth, requires her inhabitants to be active, and saving in her productions, lest Saturn, or Time, should waste and destroy them.

USEFUL RECEIPTS FOR THE TRADE.

ACID COLOURING.—There are two processes for colouring, similar in purpose and effect; the oldest is called dry colouring, because the chemicals used are solids, namely, saltpetre, alum and salt, but acid colouring has come into more general use on account of its being easier to manage and of the wider range of qualities of gold which can be submitted to the process. The purpose is simply to remove from the surface of the gold all alloy so as to leave a coating of pure gold of rich yellow colour, which is very finely frosted, to obtain which, with perfect equality, it is necessary to have the surface smooth, then anneal and boil out in pickle made of nitric acid and water,—lastly, annealing black before dipping in the color. A good formula for colouring mixture, saltpetre 9oz. 12dwts.; salt 4oz. 16dwts.; muriatic acid 6½oz. The effect on the article is necessarily to reduce the weight, therefore the quicker it is done the better, and if the gold be properly alloyed 1½ minute is sufficient time to expose them to the action of the mixture, which must boil up till it fills a No. 10 black lead crucible. In all acid coloured work there is between the body of gold and the outside colour a brown coat of partially coloured material, and if the work is left too long in the mixture the coat is much thickened, and the fine colour may be easily peeled off, especially if the gold be too low in quality. The finest colour and best surface may be obtained on about 15 carat gold, but the range is from 12 to 20 carat, and to be successful the operator needs considerable practice. Before using a crucible it is necessary to have it well annealed, as accidents are thereby avoided. To prevent change in the colour of goods, after colouring, it is well to wash them in ammonia, which will neutralize any salts that remains in the somewhat porous surface, and if the articles are scratch-brushed, which slightly brightens them, they are less liable to soil. It is best not to give the ammonia bath till after brushing, following with a good wash in hot water and drying in hot saw-dust.—H. G. M.

CLEANING SILVER WATCH DIALS.—Take about a tea-spoonful of saltpetre, and mix with it about two dessert spoonfuls of finely-powdered charcoal; willow coal is the best. Let these be ground together with a little water on a piece of slate with the blade of a knife; then, by the aid of a camel-hair pencil, spread a portion of the mixture evenly over the surface of the dial, which must then be laid on a piece of charcoal, and, with a blowpipe and the clear flame of a lamp or gas jet, it must be made just red hot, and kept so till the wet powder has ceased to fly about; it must then be thrown from the charcoal, hot as it is, into a mixture of sulphuric acid and water (in the proportion of about one fluid ounce of acid to three half-pints of water); it will then have a snow-white appearance, and must be washed with brush and soap in clean soft water, and put into fine sawdust, or, what is better, rosewood raspings, till quite dry.—*Scientific American*.

SILVER ALLOYS.—No. 1. Silver 11 ounces, 2 pennyweights; copper 18 pennyweights. No. 2. Silver 1 ounce; copper 1 pennyweight, 12 grains. No. 3. Silver 1 ounce; copper 5 pennyweights.

ALLOY FOR PLATING.—Silver 1 ounce; copper 5 pennyweights.

GOLD SOLDER.—Proportion for 100 parts:—

Silver ...	...	...	54.74
Gold ...	...	...	11.94
Copper ...	...	...	28.17
Zinc ...	...	...	5.81
			99.86

Melt the three first metals together in a covered crucible; when the cover is slightly cooled add the zinc a little in excess to the proportion given, and stir up continually the alloy; this solder runs very easy and is much esteemed by manufacturers.

SILVER SOLDER.—No. 1. Silver 1 ounce; pin-brass 10 pennyweights. No. 2. Silver 1 ounce; pin-brass 10 pennyweights; pure spelter 2 pennyweights. In fine silver filigree work, fine silver is always used for the filigree. The framework is generally made of sterling silver. The solder for such work is as follows:—Silver 4 pennyweights, 9 grains; pin-brass 1 pennyweight.

COMMON SILVER, FOR CHAINS.—Silver 6 ounces; copper 4 ounces.

SOLDER FOR THE ABOVE.—Silver 16 pennyweights; copper 12 grains; pin-brass 3 pennyweights, 12 grains.

SILVER SOLDER, FOR ENAMELLING.—Silver 14 pennyweights; copper 8 pennyweights.

SOLDER FOR FILLING SEAL RINGS.—Silver 20 ounces; copper 3 ounces, 8 pennyweights; pin-brass 13 ounces; spelter 1 ounce.

QUICKSILVER SOLDER.—Silver 1 ounce; pin-brass 10 pennyweights; bar tin 2 pennyweights.

OUR ILLUSTRATED SUPPLEMENT.

WITH this Number we have the pleasure to issue a very elaborate facsimile of the exhibit of the American Watch Company at the American Centennial. The exhibit of this company consisted of 2200 cased movements of various styles and grades, and this vast number is said to merely represent the work of one week at their factory. By way of contrast to the finished masterpieces of horological art of the present day, two old watches are shown in the exhibit. One of them belonged to Colonel Ethan Allan, of Treconderoga fame, while the other is of greater antiquity, being a Hollister Timepiece, dated 1658. The former is a plain silver watch, somewhat discoloured by age, while the latter is encased in brass, and a very rudimentary example of a watchmaker's skill. It has no hair spring, and is made on the Verge principle, with catgut instead of chain; has only one hamp, and cannot be set right, but must run down and then be started again. These watches are of peculiar interest at the Centennial Exhibition, and clearly show the progress which had been made during the past 100 years. One great novelty in the exhibit is the display of several cases, finished in silver, with gold mountings. The entire exhibit is one of the most elaborate to be met with in the Exhibition.

MORRISON'S GOLD AND SILVER SOLUTIONS.

IN an article describing the Highest Medal Exhibits at the Centennial, the *Boston Journal of Commerce* has the following, referring to these solutions:—

"The art of gold and silver-plating by electro deposition has made rapid strides within the past twenty-five years, and has finally been improved upon so that the cumbrous battery, with its attendant annoyances of corrosives and cleaning, is entirely superseded by the invention of elegant solutions, cheap and clean, which will accomplish as much with far less trouble and expense. These have been patented by Mr. A. B. Morrison of Portland, Me, who exhibits them at the Exposition, where they, or rather their results, attract great attention. He takes any article of cheap jewellery of "candlestick gold," as a chain or a bracelet, or any part of a watch, a plate, a bridge, a case, or other article; applies the solution, and immediately, or within a very short time, they become coated with a uniform and substantial plating, equal in firmness, fineness, and in tenacity to that deposited from the ordinary cyanide solution by a battery, and obtained, of course, at the cost of much less elaborate preparation and anxious care. These solutions are said to be made from pure gold and silver, and promise to be invaluable to watchmakers in re-plating injured parts of watch movements, cases, &c.; or jewellers for re-plating Etruscan, Roman gold, and other cheap jewellery; and no less to opticians and philosophical instrument makers. Their use is so simple that they can be used by any person of ordinary intelligence, even if a lad. Those in the trade that have used the solutions recommend them to be all that is claimed for them, that they are destined to become exceedingly popular, and to finally entirely supplant the old process, with its troublesome battery and slow process. The solutions are recommended by many jewellers of great prominence; among them J. C. Whitehouse, superintendent of the watch department of Tiffany and Co., of New York, and are sold all over the country. Mr. Morrison also shows a jeweller's restorative for cleaning jewellery, silver and plated ware. He tries its effects in the presence of numerous admiring visitors on all kinds of tarnished articles, including many that are handed to him by casual passers, and invariably produces a beautiful mirror-like surface upon articles previously dark from the neglect of years. It seems to accomplish the object more effectually than any other preparation which I have ever seen, and containing as it does no injurious articles, can scarcely fail to find great favour among all who handle much silver. These articles are so strikingly novel and produce such wonderful effects that they received most flattering notice from the judges, and were deservedly complimented with the highest award."

EXTENSIVE ROBBERY OF JEWELLERY.—An extraordinary robbery of jewellery, valued at 4000*l*. has been effected during the transit of a lady's jewel case from London to Barton, Warwickshire. The jewels were the property of Miss Dickens, the daughter of an officer in the army, who is about to proceed to India. They had been deposited with a London jeweller for safety, and were sent by him in a box as an ordinary parcel. Upon arrival of the box at Barton, it was discovered that all the jewellery had been extracted. The affair is under investigation.

THE Watchmaker, Jeweller, and Silversmith,

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Mr. THOS. LEIGHTON, 21 & 22, Snow Hill.

Messrs. SWINDEN & SONS, 27, 28, & 29, Temple Street.

Messrs. LAZARUS BROS., 52, Frederic Street.

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Cheques and Post-office Orders to be made payable to A. VICTOR, at Holborn Viaduct Post Office, W.

NOTICE.

IN future copies of the WATCHMAKER, JEWELLER, AND SILVERSMITH, will be supplied to the Retail Trade, Booksellers and Newsagents, by Messrs. Catty and Dobson, Wholesale Booksellers, 1, Ivy Lane, Paternoster Row, London.

THE Trade are informed that Mr. L. Schiff, heretofore travelling for this *Journal*, has entirely ceased his connection therewith.

MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

VILLIERS EDMUND, 59, Frith Street, Soho, jeweller and importer of fancy goods. Nov. 1.

WHIEWAY JAMES, 2, Northampton Street, Birmingham, jeweller. Nov. 1.

KENT CHRISTOPHER DAVID, 46, Red Lion Street, Holborn, watchmaker. Nov. 13.

LEWIS WILLIAM, 58, Albion Street, Birmingham, jeweller. Nov. 6.

BOTHROYD JAMES, Ferryhill, Durham, grocer and general dealer, jeweller, &c. Nov. 16.

DYKE JAMES HENRY, New John Street, West, Birmingham, jeweller. Nov. 11.

MILLER JAMES ROBERT, Earlsbrook Road, Earlswood, late Western Road, Brighton, jeweller. Nov. 14.

WILLIAMSON ARCHIBALD, 27, Fold Street, and Princess Street, Bolton, watchmaker and agent. Nov. 15.

FALLER BENEDICT, Vicar Lane, Leeds, clock and watchmaker. Nov. 21. At C. Granger's sol. Leeds, Dec. 7 at 3.

POLLITT JOSEPH FAULKNER, 7, Albion Street, Gaythorn, late Oxford Street, and Lowndes Street, Moss Side, all Manchester, watchmaker. Nov. 21. At Needham, Parkinson & Slack's, sols. 10, York Street, Manchester, Dec. 6 at 3.

WIGTON WILLIAM, 28, Cheapside, Bolton, watchmaker and jeweller. Nov. 18. At W. Scowcroft's, sol. Bolton, Dec. 7 at 3.

Trustees Appointed.

FREW THOMAS and WILLIAM ELLIS, trading as T. FREW & Co. (Liq.). Penrith, jewellers. Trustee, Edward T. Pearson, Coventry, accountant.

KELLER PHILIP and EMIL HAHN (Bkt.) 46, Hatton Garden, and Warston Lane, Birmingham, dealers in precious stones. Trustee, John Sear, 105, Cheapside, accountant.

MOGER JAMES A. (Liq.). Royston, Cambridge, jeweller. Trustee, Frederick B. Leeming, 10, Coleman Street, London, accountant.

Notice of Second Meetings.

RICHARDSON WILLIAM, Stretford, Lancashire, watchmaker. At J. A. Horner's sol. 3, Clarence Street, Manchester, Dec. 1 at 3.

Dissolution of Partnership.

SCOTLAND.

MURRAY & THOM, 73, Leith Walk, Leith, jewellers, &c. Oct. 31. Debts by J. W. Murray.

DAVIS J. & Co., St. Pauls Square, Birmingham, jewellers. Sept. 21. Debts by Joseph J. Davis.

MANN & HUNT, The Cross, Gloucester, watchmakers and jewellers. Sept. 23. Debts by William C. Mann.

Adjudications of Bankruptcy.

HAMBURGER S., trading as S. HAMBURGER & Co., 38, Frederick Street, Birmingham, jewellers' factor. Nov. 7. At C.C., Birmingham, Nov. 20 at 3. Cole, Registrar.

HUTCHINSON JOHN JOSEPH WILLIAM, Stratford Street, Birmingham, clock case manufacturer. Nov. 7.

KINGSTON JOHN THOMAS, High Street, Ramsgate, jeweller. Nov. 20. At C. C. Canterbury, Dec. 13 at 2. Furley, Reg.

Scotch Sequestrations.

MORRISON ROBERT, Inverness, watchmaker and jeweller. Nov. 15 with protection. Tr. and Com., Procurators' Chambers, Castle, Inverness, Nov. 25 at 12. Claims by March 15. Agent, John Colvin, Inverness, sol.

YUILL THOMAS B., 13, Main Street, Gorbals, Glasgow, and Town Buildings, Pollokshaws, near Glasgow, watchmaker and jeweller. Nov. 17 with protection. Tr. and Com., Faculty Hall, Glasgow, Nov. 30 at 12. Claims by March 17. Agent, Angus Campbell, 109, West George Street.

Distribution of Assets.

ROPER FRANCIS, Halifax, general ironmonger and silversmith, died June 4, 1862. Claims by Dec. 9 to W. H. Boocock, Halifax, sol.

PATENTS.

Application for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

4261. WILLIAM WIGGINS, of Stanmore Street, Caledonian Road, London, Goldsmith, for an invention of "Improvements in the manufacture of watches to prevent robbery by breaking the bows thereof."—Dated 4th November, 1876.

4297. DAVID CUTLER, of Birmingham, in the county of Warwick, Manufacturer, for an invention of "Improvements in solitaires, sleeve links, shirt, collar, and other studs, and other similar dress fastenings and ornaments."—Dated 7th November, 1876.

4447. ALEXANDER LESLIE FIFE, of Aldersgate Street, in the city of London, for an invention of "Improvements in shirt studs and dress fastenings."—Dated 17th November, 1876.

4570. EDITH ANNIE FOX, of Birkenhead, in the county of Chester, spinster, for an invention of "Improvements in and appertaining to pockets for wearing apparel, parts of which improvements relate to a safety attachment for securing watches, chains, and other like articles."—Dated 25th November, 1876.

Grants of Provisional Protection for Six Months.

3113. To HENRY PEARCE, of Huddersfield, in the county of York, Jeweller, and WILLIAM HENRY DOUGLAS, of Stourbridge, in the county of Worcester, Jeweller, for the invention of "Improvements in studs and solitaires."

3924. To JOHN ALEXANDER LUND, of the firm of Barraud and Lund, of 41, Cornhill, in the city of London, Manufacturers, for the invention of "Improved means or apparatus for synchronizing clocks or other time-keepers and for transmitting seconds or other time or intermittent currents."

3966. To EMANUEL FREDERICK GRIFFIN, of Handsworth, in the county of Stafford, Manufacturer, for the invention of "Improvements in solitaires, sleeve links, collar and other studs, buttons, and fastenings for articles of dress and other articles."

4049. To JOSEPH OPPENHEIMER, of Manchester, in the county of Lancaster, Merchant, for the invention of "Improvements in pendulums for time-keeping apparatus."

3973. To CHARLES PAYNE and PETER STEEL, both of the city of Manchester in the county of Lancaster, for the invention of "A new or improved device or means for securing scarf pins, brooches, and other descriptions of jewellery."

4007. To JAMES GRASON, of 4, Fore Street, Tiverton, in the county of Devon, Jeweller, for the invention of "An improved self-locking shirt stud, applicable also for other fastening purposes."

4251. To GEORGE WALKER, of Birmingham, in the county of Warwick, Gilt Toy Manufacturer, for the invention of "Improvements in the construction of solitaires, shirt studs, and other such like fastenings."

3978. To HENRY JULIUS HALPIKE, of Shepherd's Bush, in the county of Middlesex, for the invention of "Improvements in sleeve links, collar studs, and other similar articles."

Notices to Proceed.

2926. HERBERT JOHN HADDAN, of the firm of Herbert & Co., Patent Agents, of 67, Strand, in the city of Westminster, Civil Engineer, has given notice in respect of the invention of "Improvements in chronometer escapements."—A communication to him from abroad by F. Herman Voigt, of Buffalo, State of New York, United States of America, Watchmaker.
3487. EMMA ELIZABETH ASHING, of Camden Town, in the county of Middlesex, has given notice in respect of the invention of "Improvements in solitaires and studs, and other similar dress fastenings."
3810. CHRISTOPHER NUGENT NIXON, of 67, Chancery Lane, in the county of Middlesex, has given notice in respect of the invention of "Improvements in the construction of pinions for actuating wheels and machinery, and in the method of pawling pinions and wheels of every description."
3924. JOHN ALEXANDER LUND, of the firm of Barraud and Lund, of 41, Cornhill, in the city of London, Manufacturers, has given notice in respect of the invention of "Improved means or apparatus for synchronizing clocks or other time-keepers and for transmitting seconds or other time or intermittent currents."
3113. HENRY PEARCE, of Huddersfield, in the county of York, Jeweller, and WILLIAM HENRY DOUGLAS, of Stourbridge, in the county of Worcester, Jeweller, have given the like notice in respect of the invention of "Improvements in studs and solitaires."
2865. ALBERT WILLIAM JONES, of Camden Town, in the county of Middlesex, and HARVEY CHAMBERLAIN, of Hamsell Street, in the city of London, have given notice in respect of the invention of "An improvement in solitaires and studs."
2892. THOMAS MORGAN, Secretary of the Inventors' Patent-right Association, Limited, 21, Cockspur Street, Charing Cross, in the county of Middlesex, has given notice in respect of the invention of "Improved watch keys."—A communication to him from abroad by John S. Birch, of New York, United States of America.
3973. CHARLES PAYNE and PETER STEEL, both of the city of Manchester, in the county of Lancaster, have given notice in respect of the invention of "A new or improved device or means for securing scarf pins, brooches, and other descriptions of jewellery."
2958. JOHN ALFRED LANGSTON, of Tavistock Street, Bedford Square, in the county of Middlesex, Architect, has given notice in respect of the invention of "Improvements in illuminating clocks."

Patents on which the Stamp Duty of 100l. has been paid, and Dates of their Production for Certificate.

3192. WILLIAM GARDNER, of the city of Manchester, in the county of Lancaster, Watch Manufacturer, for an invention of "Improvements in mechanism or tools for the manufacture of parts of watches or time-keepers, and in the mode of securing the works of watches in their cases."—Dated 3rd November, 1869.

Patents on which the Stamp Duty of £50 has been Paid, and Dates of their Production for Certificate.

3730. WILLIAM EDWARD WILEY, of Birmingham, in the county of Warwick, for an invention of "Improvements in fastenings for shirt studs, sleeve links, solitaires, and other articles of jewellery and dress, which improvements are also applicable to pencil cases and lead boxes."—Dated 17th November, 1873.

Patents which have become Void.

3640. JOHN CHESHIRE, of Birmingham, in the county of Warwick, Manufacturer, for an invention of "Improvements in studs and clasps."—Dated 8th November, 1873.
3646. MARTHA JANE CREESE, wife of Joseph Creese, of Birmingham, in the county of Warwick, Lithographer and Printer, for an invention of "Improvements in brooches and other dress fastenings and dress ornaments."—Dated 8th November, 1873.
3685. CHARLES EDKINS, Button Manufacturer, THOMAS GREAVES, Jeweller, and JAMES NEWMAN, Jeweller, all of Birmingham, in the county of Warwick, for an invention of "Certain improvements in the construction of sleeve links, solitaires, and other looping or connecting articles of jewellery."—Dated 12th November, 1873.

Patents Granted in Foreign States.

AUSTRIA.

17. W. HIRSCH, of Vienna, for "Fastenings of eardrops."—2 years—(Public.)—Dated 2nd June, 1876.

BELGIUM.

- 40,640. L. V. HUE, for an imported invention for "Manufacturing glass and crystal articles with diamond designs."—Dated 14th October, 1876.—(French Patent, 13th October, 1876.)

- 40,796. D. VANDERVENNET, of St. Josse-ten-Noode, for "A new mode of applying gold on wood and on metals."—Dated 7th November, 1876.

FRANCE.

- 113,840. MAQUAIRE, for "Advertising jewellery."—Dated 20th July, 1876.

- 113,883. POCHNET, for "Ornamenting small gold articles."—Dated 21st July, 1876.

- 113,908. MANCHE, of Paris, for "A winding-up alarm for clock-work."—Dated 26th July, 1876.

- 113,930. DE FERRIERE and CATEAU, for "Securing precious and other stones and precious metals on all sorts of jewellery."—Dated 26th July, 1876.

- 113,967. DESSOUSLAY and LANDRY, for "A lathe for fixing hands in clocks."—Dated 29th July, 1876.

- 114,008. MELOT, of Paris, for "Galvanoplastic dials of watches, clocks, &c."—Dated 2nd August, 1876.

- 114,032. HAAS, jun., and Co., for "A clock with a night-light."—Dated 4th August, 1876.

- 114,087. ZAFFIRA, for "Improvements in watches, clocks, and chronometers."—Dated 7th August, 1876.

- 114,148. ROYER-AMOT, of Chateauvillain, for "A waker-watch."—Dated 19th August, 1876.

ITALY.

36. L. AMIS JUNOD-PATTUS, of Sainte Croix, for "Remontoir or pendant watches repeating the quarters, without wheelwork or hammers."—6 years.—Dated 15th July, 1876.

Certificates of Addition.

- 109, 095. PHILLIPS and DUFOUR, for "A waker-watch acting by explosion."—Dated 3rd August, 1876.

Applications for Patents for Inventions Granted in British Colonies and Dependencies.

2270. HENRY ROSALES, of Waltham, Mining Engineer, for an invention of "An improved process of extracting gold from pyrites."—Dated 13th September, 1876.

Patents Sealed.

3597. RICHARD HARRISON, of 14, Dawson Place, Bayswater, in the county of Middlesex, for an invention of "Improvements in fastenings for ladies' cuffs, partly applicable to studs generally."—Dated 14th September, 1876.

2008. HENRY YARDLEY, of Birmingham, in the county of Warwick, Manufacturing Jeweller, for an invention of "An improved catch or clasp, applicable as a fastening for solitaires, hooks, purses, and other articles of a like or similar nature."—Dated 13th May, 1876.

2119. JAMES CARPENTER and GEORGE MARTIN, of St. John Street Road, Clerkenwell, in the county of Middlesex, and of Tooting, in the county of Surrey, Clock Manufacturers, for an invention of "Improvements in clocks, or similar time-keepers."—Dated 19th May, 1876.

3244. PETER GEORGE WILSON, of the town and county of Inverness, North Britain, for an invention of "Improvements in brooches, whereby they are rendered convertible into pendants."—Dated 18th August, 1876.

3616. WILLIAM HENRY DOUGLAS, of Stourbridge, in the county of Worcester, Jeweller, for an invention of "Improvements in studs or clasps."—Dated 15th September, 1876.

Patent Cancelled.

1. H. MERLET, of Nancy, for "A suspension of pendulums for time-pieces."—Dated 18th June 1875.—Cancelled 1st September, 1876.

THE INTERNATIONAL PATENT LEAGUE.

THE *Mechanic* says—"At the Bremen Conference on the Assimilation of Patent Laws, held at the end of September, it was resolved to re-appoint a committee, whose duties would be to assist in bringing about an international understanding upon patent protection as soon as possible. The London Committee, of which Dr. Siemens is chairman, will no doubt be enrolled bodily in the new committee, and the co-operation of manufacturers and others, who will join them in going thoroughly into the question, is anxiously requested. Sir Traver Twiss, who presided in the absence of Lord O'Hagan, stated that the Vienna resolutions would be taken as a basis on which to work; but the committee would not be in any way bound to support them. There is every reason to hope that the efforts now making will result in an assimilation of the patent laws throughout Europe, and that such countries as Germany will in future offer a *bona-fide* protection to inventors instead of a sham, and that Holland and Switzerland will join the International Patent League.

In reply to an esteemed correspondent from Ramsgate, we must state that the subject matter of his enquiry, submitted some time since will shortly be dealt with in one of our leading articles. It is one which would involve too lengthy an explanation in a simple reply, and we must ask forbearance with our delay till such time as the subject can be treated of in the manner indicated.

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A MONTHLY TRADE JOURNAL,

Devoted to the Interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades.

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HOROLOGY.

XX.—LONGITUDE.

THE subject which we are now about to treat of is at one and the same time the test and the grand arbiter of horological excellence. All nations and all ages that rose with the dawn of civilization in the world have deemed their longitude of the very first importance; and wide and numerous have been the experiments to enable the anxious mariner to define his place of travel over the pathless ocean. It was reserved for the chronometer to unravel the story for all time to come, and for the benefit of all mankind.

Longitude, as its name implies, signifies length, simply; but the term is now exclusively applied to astronomy, and what we will term astronomical geography; that is, the length east or west of a given position. We have had occasion during our papers on dialling to touch upon some of the elementary points of longitude to illustrate our meaning; in what we have now entered upon, however, we intend to fully explain not only what longitude is in its scientific aspect, but its close relationship to practical horology. We, therefore, with some confidence, bespeak the studious reader's attention, with the assurance that it will not be idly bestowed.

We must premise that there are two kinds of longitude, namely, the longitude of the heavenly bodies, not only in relation to each other, but to us. That is called celestial longitude. The second kind is terrestrial longitude, which deals with the earth and our motion to and fro upon it. In endeavouring to master this subject we must be very careful to keep terrestrial longi-

tude quite distinct from celestial; the first is reckoned from the equator, whilst the second is from the ecliptic. Let us remind the reader that the equator is that great circle of the earth which it divides into northern and southern hemispheres; on the other hand, the ecliptic is that other greater circle, known to us as the sun's annual path among the stars. There is this, however, in common between them—every terrestrial longitude has its meridian, or highest circular line, whilst every celestial longitude has also a meridian corresponding to the one belonging to the earth. We must, for horological purposes, deal as closely with the terrestrial part of our subject as we can, or we shall become too astronomical for the reader's thinking; in a word, there is but one equator, but the meridians are numerous.

Although longitude belongs so clearly to the chronometer that no intelligent "timer" can afford to be ignorant of its principles, we must also remember that latitude is its twin "partner in the concern." And now is the place for the reader to have a map of the world, or better still, a small globe before him. We are not going to technically describe this globe, but to direct attention to only as much as can be comprehended in relation to what we are speaking about. The globe will be found to turn upon an axis, representing the imaginary axis of the earth, whilst at the north and south poles a brass hour circle will be seen, showing every hour from I. to XII. inclusive. There is, too, a flat wooden ring with the signs of the zodiac, and other things painted upon it; this is the horizon, but for our present purpose we will discard it here, its use being to work problems of daylight and darkness under varying circumstances. What concerns the reader is a brass semicircle, extending from the south up to the north pole, divided up to 180 degrees. There are also on the surface of the globe the line of the equinoxes, the

celestial, already alluded to, the zodiac, the two tropical circles, and the polar circles. A brass quadrant divided into 90 deg. is fitted on the brazen meridian. We have now arrived at the point in which latitude and longitude have to be worked together. Every degree on the brass meridian represents a circle of latitude, these circles commencing from the equator and being marked north and south to each pole. The meridians again, passing right round the globe through the poles at right angles, or in a contrary direction to the circles of latitude; that is, they cross each other. The meridians are divided into degrees that express both time and space, whilst the circles of latitude express space only. As we have before stated, these circles commence at the equator, which is the greatest of them all, and is marked O; they are nearly all the same distance apart, ending at the poles, being 90 deg. each way. In contradistinction to this the meridians of longitude decrease as they approach the poles, where they all cross each other on an imaginary point, to pass down and spread out on the opposite side of the globe, thereby completing their circuit. It may be asked if the circles of latitude maintain nearly equal spaces from the equator to the poles, how is it that the meridians are not similar? The question is easily answered, and the answer as easily demonstrated. If the earth were a flat surface of square dimensions, like a "four-cornered" field, nothing would be easier than to draw parallel lines at equal distances crossing each other, as any one may learn with a ruler, pencil, and a square piece of paper. But as the earth is a sphere, very aptly likened to an orange, bulging out to the widest at its central part, and slightly flattened at each end, any one, even without a knowledge of trigonometry may soon satisfy himself that if he will carry two lines at equal distances from the bulge up to the top of the orange, those lines will approach each other until they meet. In addition to the orange, let us familiarize the demonstration by another fruit. Our readers may have had in the season a very round kind of apple, with natural lines or seams (as though cut with a knife) all round it, in the direction of its top and bottom. He has only to look at those lines to ascertain the diminution of space between them as they near the top. The reason of this is equally plain. In all spherical bodies there is an axis, or line, that runs through their centre from whatever point on the surface the observer may choose. In order to be quite practical, let him take the orange and push a small wooden skewer through it in the direction of its growth, which, will be from top to bottom. He will then have an axis, a surface, a circumference, a diameter, and two poles, without any further trouble. He can handle the orange, and turn it whatever way he likes without doing any damage, whereas, not being used to it, he might injure the globe on the table before him. He will see that, as the circles of latitude on the globe rise towards the pole, the diameter decreases; hence the meridian lines being in a straight direction from pole to pole, as the space towards the pole becomes smaller and smaller, the meridians must necessarily get closer and closer, until, as we have before stated, they all pass over each other as one point, and spread out again as they travel down the other side. The diameter of the orange can be tested by sticking the skewer through it at given distances, until the place or pole is reached where there is nothing to stick through.

And here we may mention that a very ingenious question has arisen out of the thousand and one discussions that have taken place about the recent North Polar Expedition, and the very pole itself; that question is as follows:—Let it be granted that all the meridional lines cross over each other so as to form only a single point at the pole; then, at that point there can be neither east nor west, for, assuming that you stood there, if you moved at all, you must move southwards, and in no other direction. Well, reasonably enough, more than one "most intelligent man" has cudgelled his brains about it. We have examined this question ourselves, applying to it rigid logical analysis, and have come to a conclusion upon it; but as it presents a nice little globe problem, we will leave it for a while to the ingenuity of those of our readers who may like to "give it a turn;" all we can say is, that it is stated in true logical form, according to the canons. We will return to our meridional time and space.

"I can now understand," says the student, "why latitude means only space; but what I want to know is, how you bring both time and space into longitude; lines, or circles, that go in the contrary direction?"

Exactly. We will endeavour to explain it in a way, we hope, that will "suit the meanest capacity."

In order to prevent any confusion with the many-circled globe, let our friend take his orange, and run through the skewer two small discs of white paper, about the breadth of a shilling—say,

an inch in diameter; let these discs be marked at three equal distances upon their circumference. Adjust these discs so that the marks shall, as it were, face each other, the orange being between, next connect them by lines drawn over the surface of the orange, and, having done that, draw another line round the widest part of that surface; having done so, carefully measure the space between any two lines, and also the space between the two marks on the disc from which the lines were drawn. The discs being each an inch in diameter, to get rid of that unconquerable figure, a recurring decimal, we will call the circumference three inches. To keep the reasoning close and homely, we will assume the orange to be three inches in diameter, and, consequently, by a similar rule to the last, nine inches in circumference. The number 3 has been adopted in order to avoid the confusion of different quantities in the mind whilst following out this demonstration. Now, take the orange, rest the lower point, or south pole of the skewer on the table, and raise the higher or north pole, to about the same obliquity as you see on the globe in its frame before you. Having done this, turn the orange slowly round, when you will see that the nine inches on its bulge lines move exactly in the same time as the one inch space on the discs. And this is precisely what the circles on a globe marked to scale will show, and what has been proved by actual experiment upon the earth itself. We have said that the earth was a sphere, and that all the circles of latitude were "nearly" equidistant from each other. This is not all mathematically correct, the exact shape, on account of the flattening at the poles, being what is called an "oblate spheroid," from oblatum—carried out, or widened at the sides, thereby making the ends a little flattened. Practically, however, the difference can be disregarded, as the equatorial diameter is only greater than the polar by about 29½ miles, which in an axis of close upon 8,000 miles does not matter much. In another form take a globe of thirty-six inches in diameter, the difference between the two axes would barely amount to an eighth of an inch! The reader, it is hoped, understands by the original demonstrations which we have enabled him to work for himself, why longitude, by moving meridians, takes in both time and space. We shall advance the subject a stage further in our next.

CINGALESE JEWELLERY.

THE Cingalese work in gold and silver with considerable dexterity, ease, and taste, and with means, which appear very inadequate, execute articles of jewellery, which are certainly admired in this country, but which are not easily imitated. The best artist requires only the following tools and apparatus:—A low earthen pot full of chaff or sawdust, on which he makes a little charcoal fire, a small bamboo blow-pipe, about 6 inches long, with which he excites the fire, a short earthen tube, or nozzle, the extremity of which is placed at the bottom of the fire, and through which the artist directs the blast of the blow-pipe; two or three small crucibles, made of the fine clay of ant-hills, a pair of tongs, an anvil, two or three small hammers, a file, and to conclude the list, a few small bars of iron and brass, about 2 inches long, differently pointed, for different kinds of work. It is astonishing what an intense little fire, more than sufficiently strong to melt silver and gold, can be kindled in a few minutes in the way just described. Such a simple, portable forge, deserves to be better known. It is, perhaps, even deserving the attention of the scientific experimenter, and may be useful to him, when he wishes to excite a small fire, larger than can be produced by a common blow-pipe, and where he has not a forge at command. The success of this little forge, it may be necessary to state, depends a good deal on the bed of the fire being composed of combustible materials, and a very bad conductor of heat. The smiths at Ceylon use a composition as a hone for sharpening knives and cutting instruments, that is worth noticing. It is made of the capita resin and of corundum. The corundum, in a state of impalpable powder, is mixed with the resin, rendered liquid by heat and well incorporated. The mixture is poured into a wooden mould, and its surface levelled and smoothed while it is hot, for when cold it is extremely hard. It is much valued by the natives, and preferred by them to the best of our hones.

INSCRIPTIONS ON OLD COINS.

TO read an inscription on an old coin, which, by much wear, is become wholly obliterated, put the poker in the fire, and when very hot, put the coin upon it, and the inscription will then appear of a greenish hue, but will disappear as the coin cools. This method is said to be practised in the Mint to discover genuine coins when silver is called in.

MIRROR OF THE MONTH.

JANUARY.

JANUARY is the open gate of the year, shut until the shortest day has passed, but then open to let in the lengthening daylight, which will soon fall upon dim patches of pale green, showing where Spring is still sleeping. It is very appropriate that this should be the first month of the year, as far as the northern hemisphere is concerned; since, its beginning being near the winter solstice, the year is thus made to present a complete series of the seasonal changes and operations, including equally the first movements of Spring and the death of all annual vegetation in the frozen arms of Winter. Yet the earliest calendars, as the Jewish, Egyptian, and Greek, did not place the commencement of the year at this point. It was not done till the formation of the Roman Calendar, usually attributed to Numa Pompilius, whose reign is set down as terminating 672 B.C. This king, who was the second, having decreed that the year should commence now, added two new months to the ten into which it had previously been divided, calling the first Januarias, in honour of Janus, the deity supposed to preside over doors (Latin, *janua*, a door) who might very naturally be presumed also to have something to do with the opening of the year. Janus was represented by the Romans as a man with two faces, one looking backwards and one forwards, implying that he stood between the old and new year. The poet alludes to this in the following lines:—

Old Janus doth appear
Peeping into the future year
With such a look as seems to say
The prospect is not good that way.

* * * * *
His reversed face may show distaste;
And frown upon the ills are past;
But that which this way looks is clear,
And smiles upon the new-born year.

Our Saxon ancestors called the month *Aefter Yule*, that is, After Christmas. It is rather odd that we should have abandoned the Saxon names of the months, while retaining those of the days of the week. Another representation of January is that which we find on the illuminated missals of the Middle Ages. It is a man, clad in white, as the type of snow, and blowing on one hand, as descriptive of the cold, and with the other pointing to a large dial hanging over his shoulders, showing that the hand of time is re-commencing its course; near him stands the figure of the sign Aquarius, into which watery emblem in the zodiac the sun enters on the 19th of this month. On the 15th the sun at London is only 8 h. 20 m., at Edinburgh 7 h. 34 m. above the horizon. There is a liability to severe and lasting frosts and heavy falls of snow. For the uninstructed mind the fall of snow is a very common place affair. To the thoughtless schoolboy, making up a handful of it into a missile, wherewith to surprise his friend passing on the other side of the way, to the labouring man plodding his way through it with pain and difficulty, to the agriculturist, who hails it as a comfortable wrappage for the ground during a portion of the dead season of the year, to all these it is but a white, cold substance, and nothing more. But in the view of modern science, under the favour of the microscope, snow is one of the most beautiful things in the museum of nature, each particle when duly magnified, showing a surprising regularity of figure, but various, according to the degree of frost by which the snow has been produced. In the Book of Job "the treasures of the snow" are spoken of, and after one has seen the particles in this way, he is fully disposed to allow the justice of the expression. Many were the discoveries and inventions, births and deaths of great men which took place in this month. Of the former may be noted the discovery of the Planetoids on the 1st January, 1801, by the Sicilian astronomer, Piazzi. In honour of a goddess, formerly in much esteem in that country, he gave the planet the name Ceres. It was the first of a number of such bodies of small size, which occupy the place due to one such body of large size, between the orbits of Mars and Jupiter. In 1861 the number amounted to seventy. The diameter of Ceres is, according to Sir William Herschel, 163 miles. Horology and Astronomy lost in the month of January, 1848, one of their greatest benefactors, Caroline Lucretia Herschel, sister of Sir William Herschel, at the extraordinary age of ninety-seven. When, after many privations and difficulties, the brother came to England from Hanover, where he was born, to seek his fortune, and had become organist at Bath, the sister came over to live with him. In time, turning his attention to telescopes and astronomy, and gaining the favour of George III., he became the greatest practical astronomer

of his age. For more than forty years did he pursue his investigations at Slough, near Windsor, Caroline assisting him. The support of the pair was assured by a pension from the king who did himself credit by conferring on William Herschel the honour of knighthood. In 1798 Caroline published a "Catalogue of Stars," at the expense of the Royal Society, which has ever since been valued by practical astronomers. After a noble career, Sir William died in 1822, and his sister then went to spend the rest of her days at Hanover. She afterwards prepared a "Catalogue of Nebulae and Star clusters," observed by her brother. The gold medal was awarded to Caroline, by Sir James South, who delivered a most brilliant discourse on the occasion, enumerating her excellent and wonderful qualities. She discovered seven comets by means of a telescope which her brother made expressly for her use. Her intellect was clear to the last, and princes and philosophers alike strove to do her honour. January mourns the death Galileo Galilei, which took place in 1642. To him and his son do we owe the invention of the pendulum, he being the first who applied its isochronous properties to clocks, and of him may be said that his last words were the monument of his fame, for in spite of the torments of mind and body to which he was subjected, his belief was still *e pur si muove*.

ROYAL ASTRONOMICAL SOCIETY.

THE December meeting was held at the Society's Rooms, Burlington House, on Friday, the 8th ult., William Huggins, Esq., D.C.L., President, in the chair. Captain James Waterhouse, Assistant Surveyor-General of India, was duly elected a fellow of the society. Mr. Dunkin read a note by M. Otto Struve, relative to a paper by Dr. Robinson, comparing the space-penetrating power of reflectors and refractors. Father Perry read a paper "On Some Diffraction Experiments which had been made by M. André." Mr. Christie read a paper on "The Gradation of Light on the Disc of Venus." Mr. Neison read a note on "The Illumination of the Disc of Venus."

ROYAL MICROSCOPICAL SOCIETY.

A MEETING of this society was held on December 6, Mr. H. C. Sorby, F.R.S., President, in the chair. A number of donations were announced and acknowledged, and Mr. W. G. Lettsom was elected a fellow of the society. The president exhibited a *fac-simile* of Janssen's microscope, made, by permission of the Dutch Government, from the original, exhibited at the South Kensington Loan Collection.

THE NEW ROUTE OF THE MIDLAND RAILWAY COMPANY TO EDINBURGH AND GLASGOW.—By this company's new route to Edinburgh and Glasgow passengers are conveyed in the Pullman cars, which are daily growing in favour, on account both of comfort and safety. Drawing-rooms by day and sleeping-chambers at night these cars are thoroughly warmed and ventilated, fitted with lavatories and accompanied each by a special attendant. In addition to the Pullman cars, these trains are formed of carriages specially constructed for the long journey over two-thirds of the entire length of the island; and, to increase the security of this important service, the carriages in question, all built on an improved principle, are fitted with the Westinghouse automatic brake.

ELECTRIC CLOCKS IN PARIS.—For making the four electric time-keepers which the city of Paris intends to erect, fifteen names have already been entered. The competition will close on September 30th, 1877, at four in the afternoon. The four clocks finally selected will be bought by the city of Paris at 200l. each. Three prizes, 120l., 80l., and 40l., will be allowed respectively in addition for the three best clocks.

A WARRANT was recently applied for at the Court in Birmingham for the apprehension of S. Hamburger, jeweller, of Frederick-street, who, it appears, absconded, leaving little for his creditors, excepting a large safe and a few other effects. At the instance of Mr. C. B. Hodgson, Waterloo-street, the solicitor in the case, an order was obtained from the Court to open this safe, as it was thought there might be some valuables in its keeping, which would help to mitigate the loss of the creditors. Accordingly the safe, which was a powerful-looking structure, with double doors, was forcibly opened by the Sicker Safe and Strong Room Company, at Soho, under the supervision of Mr. J. F. Elwel, when it was found that the contents did not add much to the assets of the estate.

THE BREMERHAVEN INFERNAL MACHINE.—ITS HISTORY, AND THE EXPLANATION OF ITS CLOCKWORK.

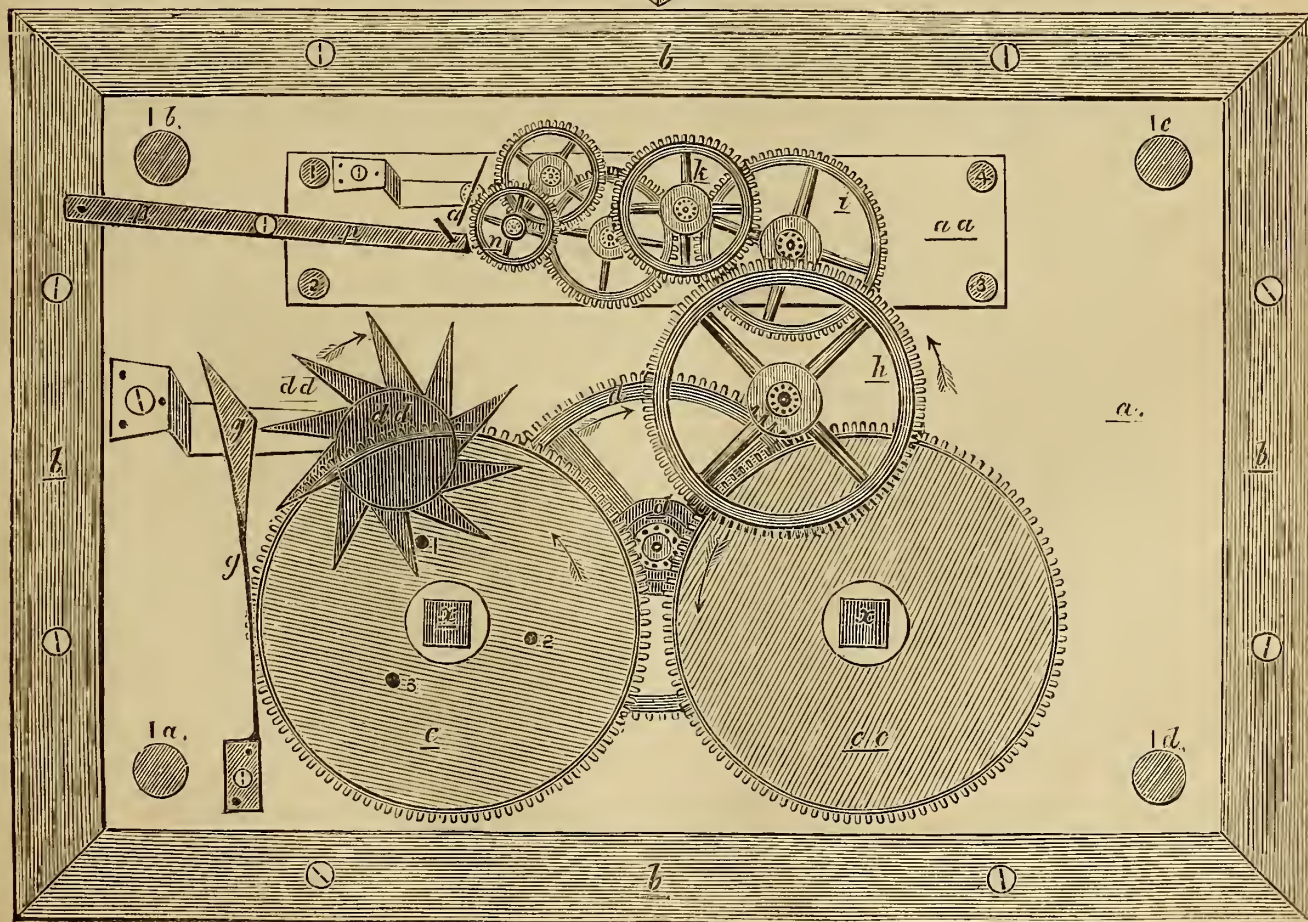
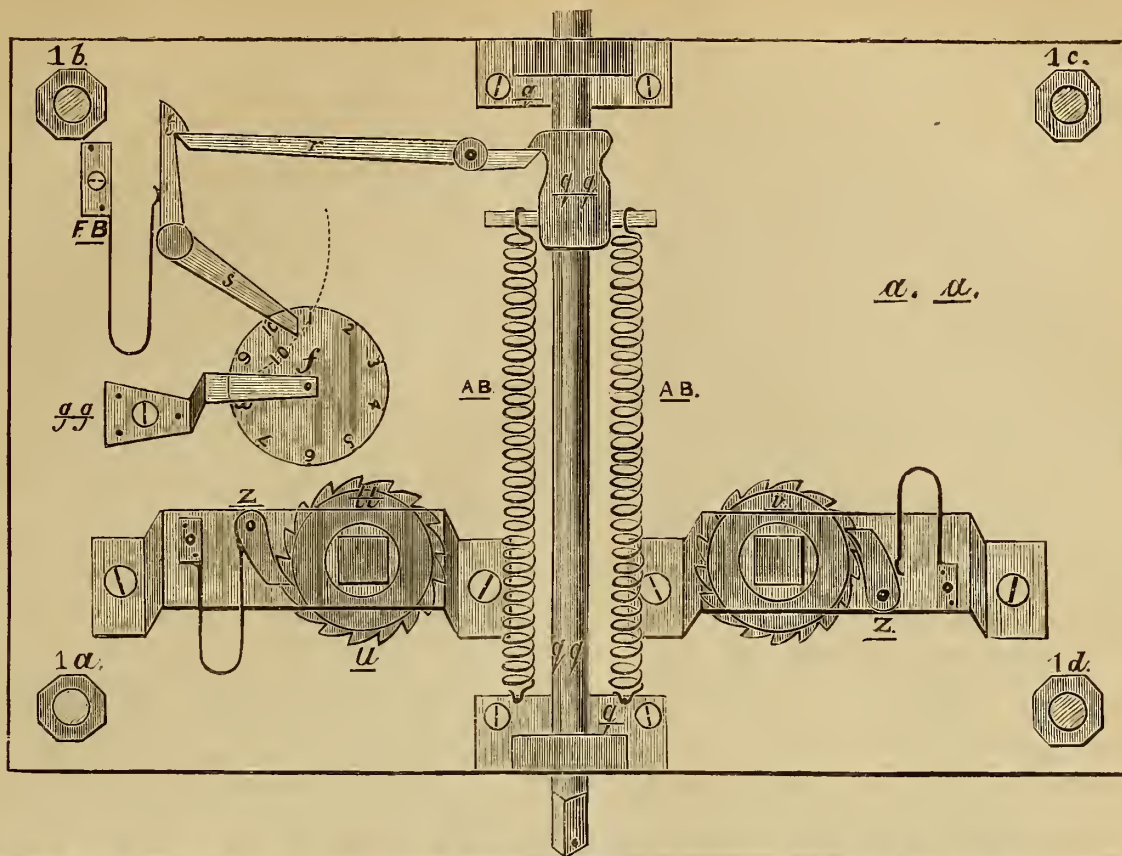
ON the 11th of December, one year since, the following telegram announced the perpetration of a diabolical, premeditated scheme, hitherto unknown in the annals of crime:—"Bremerhaven, 11th December, 1875. A terrible explosion occurred here this morning. Just after the North German Lloyd Steamship *Mozel* had embarked passengers for New York from the steam tug *Simson*, in the outer harbour, a case containing some inflammable composition, lying on the wharf, exploded, killing and injuring upwards of 100 persons."

Although the explosion was an accident as regards the time of its occurrence, it is only too clear that what happened at Bremerhaven was intended to happen some days later on the open sea, where the consequences would have been more disastrous. The design of the plot, thus terribly frustrated, was, that the cask of dynamite, which revealed itself so unexpectedly and so prematurely, should have been stowed safely on board the *Mozel*, a passenger ship, just as she was starting on her voyage to New York, *via* Southampton, with her freight of human beings. The originator of the scheme was to have sailed with her herself as far as Southampton, where some property of his own, insured very much beyond its value, was to have been shipped. At Southampton, he was to have gone ashore, leaving a machine so placed and arranged, that after having worked silently for some days, it would have delivered a blow on the dynamite with sufficient force to explode it. This, it was calculated, would have secured the sinking of the vessel, and it is probable, indeed, that the effect would have been immediate, and that there would have been no survivor left to tell the terrible story of what had happened. One more vessel would have been posted as missing, and in due time it would have been concluded that she had gone down, with all hands, from some unknown peril at sea. Thomas' object would thus have been gained, while all trace would have been wiped away of the means by which it had been effected. Although the circumstances connected with the frustration of the design are well-known, and doubtless remembered by our readers, nevertheless, as the infernal clock work machine (as we may be allowed to term it) was specially manufactured for the purpose, and was somewhat different in construction to the ordinary clock work, we believe that a full and complete description thereof will not be uninteresting, and have therefore prepared illustrations of the entire machinery, which, together with a detailed description thereof, we now place before our readers. As the description is curtailed and compiled from the pen of the repairer of the instrument, it may be considered perfectly accurate in every detail. The illustration of the clock work has been faithfully executed by Mr. W. H. Dorrington, of Fleet Street, who has done justice thereto from the drawings placed before him.

On the 25th of November, 1875, one Thomson, *alias* Thomassen, entered the shop of the clockmaker, Friederich Bruns, in Bremerhaven. The latter being absent, one of the clerks attended and received from the hands of the customer, for repairs, a large, peculiar-looking clock work, or more properly speaking, a running work, because an escapement, or stop wheel, with regular stoppage, was missing. The work had only a contrivance for catching the wind, termed a windcatch, or regulator, because it is in communication with the wheel work, and causes the regular revolution of the wheel. But this regulation is in no way to be compared, with regard to exact motion, to the stoppage by means of the stopping wheel, although, when accurately made, the regulation by means of the windcatch can be very exact, especially when it is improved by a mechanism constructed on purpose for this object, such as Mr. J. J. Fuchs, manufacturer of turret clocks, of Bernberg, has indicated by his windcatch with regulating balls. In our case, however, the regulation by a windcatch is to be preferred, because the machinery works with less noise, when their is a correct proportion between wheel and spring, and it is under the direction of a practised hand. A perfectly noiseless motion is, however, utterly impossible, as the quick grasping one into the other of the teeth and wheels produces a continual friction, and consequently a slight noise, and at the same time a never ceasing hum is caused by the windcatch dividing and moving the air in its constant rotation. This noise can be detected in any common clock with striking mechanism, as soon as the striking commences; it is very loud in an American house clock, and very soft in a well-constructed pendulum clock. It is natural, that, for reasons easily imagined, Thomas took very great care to have the movement as noiseless as possible, in order to increase the difficulty of detecting so heinous a crime. In case suspicion should have arisen, it would have been an easy matter, by means of a judicious experiment, to discover even however small a noise in such a running

work. If, for instance, the suspicious object is placed on something hard, which is not sound-receiving, and the thin end of a tin tube, in the form of a speaking trumpet, be applied to the questionable object, then the weak hum of the running work will at once be heard, issuing from the tube. The experiment is attended with more success when the object is placed on sounding boards. Thomas could have packed the work in separate parts, which would have suppressed the noise, but also his intentions. On the 27th of November, Thomas entered the shop of Bruns again, to fetch back the clock work. The repairs, however, had not been commenced, as the proprietor of the shop told the stranger (Thomas) who had not yet mentioned his name, (his intention being to fetch the machine himself) that it did not lie in his branch, as he repaired watches, and this was more the work of a turret clock maker. Thomas, however, was satisfied to leave it in Mr. Bruns' hands till the 29th, by which time it was finished. The construction of the clock was peculiar, but the hammer being missing, it was impossible to guess the object in view. On being questioned as to the use of the dial, Thomas gave no answer to the point, but prevaricated. On the 29th of November, he returned, paid for the repairs (about six shillings), but did not yet take the machine with him, saying that he would return for it in a few days. On the 2nd of December he came and fetched it, asking whether it was quite wound up, as the spring might break, and nothing more was heard of him till the news of the awful explosion filled the town with terror. Till the following afternoon everybody was of opinion that it was a dreadful accident. Then the suspicion was aroused that a crime had been contemplated and committed. The daily papers gave some details about the affair, and connected it with some clock work infernal machine, and made some mention of a very stout man. This made the watchmaker Bruns remember Thomas, and he hastened to the police-station to tell all he knew. His account of the man Thomas coincided with the description given, and a confrontation at Bremerhaven put all doubt out of the question. At the request of the magistracy, Bruns made a drawing of the machine from memory, and with the help of this, and one in an illustrated contemporary of the time, Mr. Friedrich Bruns has made the annexed diagram, and given the following explanation of the drawing. The two areas marked *a* and *aa*, are the two plates of the work, *a* being the lower, *aa* the top one; they are 35 ctm. long, 23 ctm. broad, and 3 mm. thick. The lower plate, *a*, was fastened on to an oak board, *b*, 3 ctm. thick. On the sides of this were eight screw holes, to screw the machine on to any object. *C* and *cc* are the two colossal spring boxes, both working on the first spring wheel, *d*, and moving it thereby with more power. Each of these spring boxes, and the first and second spring wheel, *d* and *h*, had 100 teeth, so that, according to moderate calculation, when wound up the work would go three or four weeks. If the springs made about eight revolutions, which would have been the least, according to the proportions or the free area within the spring box, and if we take into account the three pegs, it would go three times eight or twenty-four days.

It may be mentioned that, if on the last wheel of the clockwork there had been a proportionate escapement, instead of a windcatch, the two colossal springs would have kept the work going for nearly two years. Each springbox had a diameter of 12 ctm., and a depth of 9 to 9½ ctm. The spring must therefore have been enormous. On the springbox, *c*, there were three stout pegs, 1, 2, and 3, which, when the springbox revolved by catching into the teeth, caused the motion of the rundle, *ddl*, which communicated directly with the releasing peg, *e*, on the dial, *f*. The action of the releasing peg was therefore caused directly from the springs. The rundle had about ten teeth, and on each movement of a tooth was regulated by the spring *g*, and thereby the tooth next following was brought in its proper position towards the pegs on the springbox. The dial, *f*, is over the upper plate near the lever, the rundle being under the upper plate, *aa*, only visible in the open wheelwork. The six following wheels, *h*, *i*, *k*, *l*, *m*, *n*, are only necessary for the manifold translation by which the motion of the windcatch is prolonged. The windcatch, *o*, is the translation of spring power with two sails, which receive the resistance of the air, forcing then the mechanism into a slow movement. Next to the windcatch, *o*, there is a long arm or bar, *p*. This is intended for the holding fast and letting go of the windcatch, and of the whole running work, and working power. This bar can be moved, according to pleasure, backwards and forwards on the outside of the plate. The two plates are fastened by four pillars, *1a*, *1b*, *1c*, *1d*, about 14 ctm. distance from one another, and between these run the two spring-boxes and the two first driving wheels, *d* and *h*. The following five wheels, with the windcatch, work in a plate, *a a a*, constructed on purpose. The pillars on it are marked 1, 2, 3, 4, and the distance of this little plate from the upper one is 4½ to 5 ctm. On the upper plate there is the lever and pulley work.



The two bridges, marked *q*, hold and guide the strong hammer *q q*, with the two spiral springs, *A*, *B*, which, at this tension, give a blow of at least 30 pounds. *R* is the spring lever, which keeps the hammer, *q q*, in tension, till the releasing lever, *s*, is lifted up by the releasing peg, *c*, on the dial *f*, which taking place direct from the springbox, exercises such an immense force. Now, as soon as the releasing peg, *c*, lifts up the lever *s*, the hook *t*, on the opposite side of this lever, which holds the balance lever *r*, is pushed back and lets it go. At this moment the blow falls, because the stretched spiral springs pull down the liberated hammer, *q q*. The safety spring, *F B*, which always pushes back the releasing lever *s* into its proper position, was not in the work, and that is probably the reason of the premature explosion. *U* and *v* are the stopping wheels, with the bridges necessary for their safety. *Z* and *z* are the stopping pins, with the stopping springs behind, the two large squares, *w* and *x* are the winding pins for the springs.

Thomas was apparently struck with horror at the sight of the mischief done, or he may have been simply driven to despair by the failure of his carefully elaborated scheme for obtaining for his goods a few more pounds than they were worth. All that is known is that he went down at once into his cabin and shot himself in the head with a pistol, from the effects of which he died after a few days. It shows us that there are men in the world with whom the least hope of contingent advantage to themselves is able to outweigh the greatest and most certain injury to their fellows. To sacrifice a fine vessel and imperil the life of every soul on board was what Thomas had prepared to do, and what he had been contriving to do for some months past, and there is scarcely a touch wanting to complete the picture of a deed the most diabolical that human wickedness could have devised.

GOLD.

(Continued from page 151).

A GAIN, the auriferous veins of South America bear a close resemblance to those of Hungary and Transylvania, being similar as to their magnitude, their relative position, the nature of the ores they include, and of the rocks they traverse. The gold mines of Transylvania are described as being situated in the crater of an extinct volcano; the ore lying in masses or veins, in a rock of trachyte, or in a decomposed felspar, evidently of igneous origin. The Ancients are said to have worked gold mines at Ischia, which, if true, is another remarkable example of the presence of gold in trachytes of an origin undoubtedly volcanic.

We must here remark that there are two principal kinds of gold mining. The one is known as *alluvial*, and the other as *quartz* mining. The latter requires machinery, and does not afford scope for that keen spirit of gambling, to which the fluctuating returns of alluvial mining give rise, but approaches, in the constancy and steadiness of its production, to the character of ordinary mines; and it appears quite possible that this form of industry may be as lasting as copper and coal-mining. That quartz is the principal matrix of gold is well known to all collectors of minerals; there is scarcely a cabinet without an example; and nearly all the mines, properly so called (not washings in alluvial drifts), have been in quartz lodes, from the times of the Romans who worked it in Transylvania and in Wales, to the present time. The quartz is itself found in the form of veins, traversing various kinds of schistose, or slate rocks; the working of such veins, however, is seldom attended with such satisfactory results as are obtained from alluvial washings; not only from the circumstance that the labour required is considerably greater, but also from the fact that such sands are continually being enriched by the action of the currents of water to which they are exposed. In Brazil the mines of Gongo Soco, and some others, have been, however, extensively worked in veins, but from the heavy expenses entailed by machinery and labour, and from the fact that the mineral obtained is seldom much richer than the alluvial sands, these undertakings have been but rarely conducted on a very extensive scale; otherwise, were it not for the amount of capital, labour and machinery required, there is no doubt gold mining would become as permanent and steady an industry as that of copper or coal mining.

Alluvial gold is simply obtained by washing auriferous sands, and is found in a much purer state than the quartz gold. From whatever rocks derived, it is common in the *alluvial* deposits near the primitive or ancient rocks. It is found disseminated in the sands of certain plains and rivers, especially at the season of lowest water, and after storms and floods, and is supposed to be torn out by the waters from the veins and rocks which they traverse, or rather, we

should say, that these sands are themselves produced by the destruction of auriferous rocks that therefore, the gold which they contain must be regarded as the *débris* resulting from the disintegration or grinding of the matrix of quartz in which it was originally enclosed. Assuming that the auriferous deposits originated in the quartz rocks, there is no difficulty in accounting for the presence of gold in ruins, creeks, and gullies, as it is so often found. The schistose, or slate rocks, so readily acted upon by the atmosphere, constantly disintegrating and exposing the quartzose dikes, leaves them unsupported and gravitating downwards, the largest blocks are crushed and crumbled in their onward course, letting loose the tenacious gold, in large or small portions, which, in obedience to their gravity, and the force of impelling torrents, roll on till they are arrested for a time in hollows, or the fissures of the slaty rocks, or quietly deposited in the sand or mud, as the case may be, by the cessation of the flood, until they are again removed by the repetition of similar causes; or they may remain for ages, undisturbed by the torrents taking another course. It therefore follows that gold, even if it be of the earliest geological origin, may and will be accumulating by alluvial deposits, in the lower valleys, as long as mountains waste and valleys exist for its reception. The richness of some of these deposits is very great. In Nevada as much as 30,000 dollars have been taken from a claim of fifteen feet square; and there are many instances where ten and fifteen thousand dollars have been taken from claims of the same size.

The greater part of the auriferous sands in Europe, as also in Africa and America, are black or red, and consequently ferruginous, which is supposed to be owing to the decomposition of auriferous pyrites.

The epoch of the formation of the auriferous alluvia is uncertain, but we may suppose it to be near that of the lignites. We are led to this conclusion by the fact, that both in Europe and America, the auriferous sands occur almost always in the neighbourhood of the beds of lignite; petrified wood, covered with gold grains, has also been found buried at a depth of fifty-five yards, in clay, in the mine of Vöröspatak, in Transylvania; the same association of fossil ore and wood occurs in South America, at Moco, and near the village of Lloro, have been discovered at a depth of twenty feet, large trunks of petrified trees, surrounded with fragmentary trap rocks, interspersed with gold and platinum.

When a country is suspected to contain gold the points to be most carefully examined are the sands of the rivers and streams flowing through it, as well as the particles of disintegrated rock which often accumulate in the eddies of ravines, formed by the action of water during great floods. The sections of rock thus laid bare should also be examined with a view to the discovery of veins of auriferous quartz, from which specimens must be broken, and afterwards carefully assayed. In examining the sands brought down by rivers, such portions should be selected for experiment as have, from local causes, been subjected to the action of rapid currents and eddies; since from the great density of the metal sought, it accumulates in those situations. It is usually found that if a river or creek produces fine scaly gold in those parts of its course which lie through a flat open country, it will, if followed into the mountainous districts, in the direction of its source, become more productive, and yield gold in the form of "nuggets," and less finely-divided grains. When the auriferous deposit is situated at a distance from any creek or pool, its working constitutes a "dry" digging, and the earth and sand removed have to be carried, for the purpose of washing, to the nearest available water. River diggings are, however, generally speaking, the most productive; and in these, the larger fragments, or "nuggets," are usually found. In such localities, however, a very careful examination is required, as the gold is seldom found at the surface, but at a greater or less distance below the present bed of the river, and the "nuggets" and larger grains are most frequently obtained from holes and crevices existing in the rocks, on which the sand and gravel repose. When these situations prove productive, pits are sometimes sunk to a considerable depth, and from such holes hundreds of pounds worth of gold have sometimes been collected in a single day by persons with only the most rudimentary knowledge of mining, whilst others, with a greater degree of intelligence, have worked during the same time at a hole only a few yards distant, without obtaining a single particle of the metal sought.

We may mention that as a general rule, in looking for gold, the rocks in the district to be examined should be either granitic, porphyritic, or quartzose, although it is also found in other formations, and particularly in clay-slate. The quartz in auriferous localities is frequently stained of a rusty brown colour, from the presence of peroxide of iron, and in many instances presents a cellular or honeycombed appearance. The tools employed by persons looking for new gold-fields, or *prospecting*, consists of a

crow-bar, pick-axe, shovel, and a large round flat-bottomed tin dish.

The examination of an auriferous rock for gold is an extremely simple operation. It is first pounded very fine and sifted; a certain quantity of the sand thus obtained is washed in the tin pan, and as the gold sinks the lighter portions of the substance are allowed to float off into some other receptacle. The largest part of the gold is thus left in the angles of the pan, and by a repetition of the process a further portion is obtained. When the bulk of sand is thus reduced to a manageable quantity, the gold may be amalgamated with clean mercury, and the amalgam obtained finally heated in an iron retort, by which the mercury is expelled, whilst the gold remains in the vessel. By successive trials in this way the proportion of gold contained in a specimen of rock or alluvial gravel may be ascertained with considerable exactness. This affinity of mercury for gold is largely employed in the treatment of auriferous substances. When gold is associated with other metals, such as copper or lead, the true proportion in which it exists, can of course only be ascertained by means of an assay.

From the great weight, and flexibility of gold, as well as from its colour, it might be thought impossible for us to confound it with any other substance; yet experience teaches us, that various other natural products, are sometimes mistaken for it. The substances which most frequently lead to these mistakes, are, *iron pyrites*, *copper pyrites* and *yellow mica*; but in every case a most superficial examination only is required, in order to detect the true nature of the mineral under consideration.

Iron pyrites, which is certainly more frequently than other substance mistaken for gold, occurs in small cubical crystals, in veins disseminated in various slate rocks; and in the coal fields, it is also abundantly found in globular concretions, or kidney shaped masses, imbedded in clay or chalk. It also accompanies the ores of all the other metals, and extends from the oldest formations up to the newest alluvial deposits. *Iron pyrites*, is, however, easily distinguished from gold, since, instead of flattening, like that metal, under the hammer, it is extremely brittle, and therefore readily broken. In the second place its weight, or rather, its specific gravity, is only about one-fourth that of gold; and lastly, when heated with nitric acid it is dissolved, evolving copious red fumes, whilst gold, when so treated is in no way affected. It is a remarkable fact, that this mineral, which is so frequently mistaken for gold, often contains minute traces of it, although it seldom occurs in sufficient amount to render its extraction a remunerative operation.

Copper pyrites, the second mineral which is frequently mistaken for gold, has a strong metallic lustre, and deep brass yellow colour. It is formed in lodes or veins, which usually occur either in granite, grauwacke, or clay-slate, although it is sometimes met with in serpentine, gneiss, and some other rocks. It is most commonly associated in these deposits with iron pyrites, blende, and galena, together with the carbonates, phosphates, and other ores of copper. When heated on a piece of charcoal before the blowpipe, this mineral readily fuses into a dull black globule, which from the presence of iron is magnetic. If mixed with carbonate of soda, and a little borax, it yields, when similarly treated, a button of metallic copper. In order to ensure success, however, this operation requires a little skill on the part of the operator; and consequently, the non-production of a button of copper must not be regarded as a proof of its absence in the mineral examined. An easier and more satisfactory experiment to determine its presence is the following:—Pulverize the ore in an iron mortar, or with a heavy hammer. The powder thus obtained is dissolved in nitric acid, and the solution evaporated nearly to dryness in a saucer or shallow vessel; water is added, and afterwards ammonia (spirits of hartshorn), in excess. If the liquid now assumes a blue colour, it is a proof of the presence of copper; and if present in any appreciable quantity, a knife, or any bright steel object, will immediately become coated with it if immersed in the dilute nitric acid solution.

Mica is one of the constituents of gneiss granite and mica slate, and gives to the former its lamellar structure. The specific gravity of this substance never exceeds 3.00, and this circumstance, together with its foliated structure, is quite sufficient to distinguish it from gold, which in colour it to a certain extent resembles.

To be continued.

For many years an old chest, supposed to contain valueless papers, has been standing in the Town Hall at Bantzen, in the Tyrol. It was opened the other day, and several beautiful drinking cups, with the dates of 1672, 1684, and 1732, some silver spoons, and a gold ring were found.

MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

- DUMBELL John, Wolverhampton, watchmaker.
MORTON George, 11, Eppingham Street, Rotherham, and 51, Carlton Street, Castleford, Yorks, and jeweller. Nov. 29.
RADNOR George, jun., 39, Thames Street, New Windsor, jeweller. Dec. 2.
HARE Henry, 389, Lodge Road, Birmingham, watchmaker. Nov. 20.
SMITH Walter, trading as W. SMITH & Co., Derwent Street, Derby, watch manufacturer. Dec. 9.
WALKLAND James, Hull, silver plater. Dec. 1.
WILLIAMS Alfred, trading as A. WILLIAMS & Co., Branston Street, Birmingham, manufacturing jeweller. Dec. 7.
DAVIES William, Hay, Brecon, watchmaker. Dec. 15. At A. Cheese's, sol., Hay, Jan. 5 at 12.
HANDLEY Alfred, Stroud, Gloucestershire, jeweller. Dec. 9.
PRIME William, Riddings, near Alfreton, Derbyshire, jeweller. Dec. 11.
COOPER William, 108, New Bond Street, Jeweller and Dealer in Works of Art. Dec. 18. At T. R. Apps', Solicitor, 7, South Square, Grays' Inn, Jan. 6 at 2.
TONKS Thomas and Thomas WARMINGHAM, Heneage Street, Birmingham, Fender Manufacturers, the said T. TONKS, late Upper Hockley Street, Birmingham, Jeweller. Dec. 18.

Trustees Appointed.

- TRUMAN Alfred, trading as TRUMAN BROS., (Bkt), Berners Street, Birmingham, jeweller. Trustee, Luke J. Sharp, Ann Street, Birmingham, accountant.
GROOS Carl (Liq), 45, Hatton Garden, Jeweller. Trustee, William H. Robinson, 72, Coleman Street, Accountant.
KINGSTON John T. (Bkt), Ramsgate, Jeweller. Trustee, Robert W. Feast, 71, Coleman Street, London, Accountant.
ADAM John & Son, and William ADAM, both Lanark, Watchmakers. Claims with Andrew Smith, Lanark.

Dissolution of Partnership.

- TRUMAN & BIRD, 3, Great Marlborough Street, manufacturing jewellers. Sept. 30. Debts by William Truman.
GATI & SON, Small Street, Bristol, Chronometer, Watch and Clock Manufacturers. Oct. 31.
MCKENSEY & Co., 69, Hatton Garden, Electro-platers. Oct. 14.
OLDHAM & SEWELL, Arundel Street, Sheffield, Electro-plate Manufacturers. Oct. 6. Debts by James Oldham.

Dividends.

- HARNESSE Cornelius B. (Liq), Lavender Hill, Battersea, and 33, Aldersgate Street, importer, and 423, Strand, jeweller. 1st div. 2/6; F. Whinney, 8, Old Jewry.
FEE John (Bkt), Sheffield, Silver and Electro-plate Manufacturer. 1st and final div. 2d.; E. Needham, 121, Norfolk Street, Sheffield.

Discharges Granted and Bankruptcies Closed.

- BENNARD, William, Hastings, electro-plater and gilder. (There are no assets outstanding belonging to the estate). Bankruptcy closed November 27.
LULMAN Alfred, Hanover Street, Islington, Watchmaker. (The bankrupt has not filed any statement of affairs, and the bankrupt was not possessed of any property that could be realised.) Bankruptcy closed Dec. 8.

The Last Days for Lodging Claims.

- HASLUCK Paul N. and Chapman B. BRIDGE (Liq), 254, Tottenham Court Road, Watchmakers. Claims by Jan. 10, to J. E. Hodges, 25, Abchurch Lane.

Bankruptcies Annulled.

- WATTLEWORTH Robinson (Oct. 17), Whitehaven, Jeweller. Dec. 20.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 10d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 10d. to 5s. (variable.)

AWARDS AT THE CENTENNIAL EXHIBITION.

THE following list comprises the awards made by the Commissioners at the Centennial Exhibition, in the various branches of industry connected with those represented by this Journal.

We understand, however, from the American organ of the Trade, that the Committee of appeals have a supplementary list under consideration, and of which we shall give particulars as soon as the information reaches us:—

BRONZES, &c.

Miller & Kripe, Philadelphia, Pennsylvania (Bronze Medallion in Relief).
Cornu Eugene & Company, Paris (Decorative and other Bronzes).
Kaffel Frères, Paris (Decorative Bronze Work).
Le Cointe Aime Joachim Leon, Paris (Vase).
Lusse Brothers, Paris (Decorative).
Louis Marchand, Paris.
Louis Martin, Paris.
Mene Pierre Jules, Paris (Sculpture).
Perrot Henry, Paris.
Saurago & Ruck, Paris.
Susse Brothers, Paris.
Susse Frères, Paris (Repoussé).
Felsing Conrad, Berlin (Reproductions).
Boschetti B., Rome (Bronzes of Art).
Chopin Felix, St. Petersburg.
Stange Nicholas, St. Petersburg.
Chiokito Suzuki, Japan.
Chiuso Hiraoka, Japan.
Genrokar Mizemo, Japan.
Koji Yamakarra, Japan.
Loyemon Momose, Japan.
Soschichi Kanamori, Japan.
Takusai Houma, Japan.
Zenbeye Saito, Japan.
Ho-Kan-Chin, China.
Hu-Kwang-Yung, China.

CHRONOMETERS AND TRANSITS.

Bliss J. & Company, New York (Marine).
Gurley W. & L. E., Troy (Levels, Compasses, &c.).
Rodavet A. H., Paris (Marine).
Dent M. F., London (and Clocks).
Frodsham Charles and Company, London.
Kuhlberg V., London (and Watches).
Mercer Thomas, London (Marine).
Poole James & Company, London (and Watches).
Sewell J., Liverpool (and Watches).
Audemars Louis, Brassus, Switzerland (and Watches).
Breting Frères, Locle, Switzerland (Pocket).
Ekegren H. P., Geneva, Switzerland (and Watches).
Grandjean Henry, Locle, Switzerland (and Watches).
Jacot Frères, Locle, Switzerland (Pocket & Watches).
Matile H. L., Locle, Switzerland (Pocket and Watches).
Nardin James, Locle, Switzerland (Pocket and Watches).
A. de Casseres, Holland (Marine).

CLOCKS.

ASTRONOMICAL AND TOWER.

Fasoldt, Charles, Albany, New York.
Gropengiesser, John L., Philadelphia, Pennsylvania.
Habl, A. & Co., Baltimore, Maryland.
A. Howhu, Amsterdam.

CLOCKS.

Ansonia Brass and Copper Company, New York.
Ithaca Calendar Clock Company, Ithaca, New York (Calendar).
Paulus E., Philadelphia, Pennsylvania (and Watches).
Spellier Louis H., Doyles Town, Pennsylvania.
Seth Thomas Clock Company, Thomaston, Connecticut.
Benget & Co., Paris (and Watches).
Bonteurs, Paris (with Singing birds).
Cravet, Bouche, Paris (Ornamental).
Farcot E., Paris.
Morel A., Paris (Decorative).
Rodanet H. H., Paris (Decorative).
Rosset E., Paris (Mysterious).
Tissot, Mayet, Murex de Jura (Regulator and Calendar).
Dent M. F., London (Chronometers).
Hipp, Neuchatel, Switzerland (Electric, &c.)
Becker G., Freiburg, Silesia.
Hadauk & Son, Kayerswerda (Turret).
Kollektiv Ausstellung, Schwabzweiler, Uhrmacher.
Lintelo Auguste, Brussels (Black Marble).

ENAMELLED WORK AND ENAMELS.

Dotin Mansuy, France (Artistic).
Maussion Miss Elise, Paris.
Nozan Lami de, Paris.
Potlier A., Paris.
Soyer Paul, Paris.
Elkington & Co., Birmingham.
Zasche Joseph, Vienna.

FRAMES FOR EYE GLASSES, &c.

Alexander Isaac.
American Optical Company, South Bridge, Massachusetts.
Black L. & Company, Philadelphia.
Diamond Jacob, Pittsburgh, Pennsylvania.

GOLD AND SILVER SOLUTION.

Morrison A. B., Portland, Maine.

GOLD PENS, CASES, &c.

Aikin, Lambert & Co., New York.
L. W. Fairchild & Co., New York.
Foley John, New York.
Hawkes G. F., New York.
Holland John, Cincinnati, Ohio.
Mabie Todd & Co., New York. (Two Medals.)

GOLD PLATED GOODS.

Barrows H. F. & Co., New York City.

JEWELLERY, &c.

Adams J. S. & Co., Rhode Island, U. S. A. (Tortoiseshell.)
Bedicheimer Isaac, Philadelphia.
Hildreth Milo, Northboro', Massachusetts. (Tortoiseshell.)
Jackson S. C., New York.
Meyer John C., New Orleans, Louisiana.
Neher Charles, Philadelphia, Pennsylvania. (Hair.)
Potter W. K., Providence Rhode Island. (Tortoiseshell.)
Simons, Opdyke & Co., Philadelphia, Pennsylvania.
Tiffany & Co., New York.
Audy Mme. Vves, Paris. (Jewellery and Pearls.)
Boucheron, Palais Royale, Paris.
Claray E., Paris.
Fornet, Bourg. (Aiu.)
Fouchard Ernest, Paris.
Guvot & Migneaux, Paris.
Murat, Paris.
Phillipe Emile, Paris.
Aitchison James, Edinburgh. (Scotch Pebble.)
Coggin J., Dublin. (Bog Oak.)
Gibson William, Belfast.
Gay J., Geneva, Switzerland.
Jean J.
Petit Pierre & Bryson, Geneva, Switzerland.
Bissinger C. Söhne, Hanau.
Backes G. F., Hanau.
Becker Fritz, Pfortzheim.
Bier A. Voltz, Hanau.
Bizer Gebrüder, Pfortzheim.
Dingeldein Gebrüder, Hanau.
Geisel & Hartung, Hanau.
Gerwig August, Pfortzheim.
Hunter Gustav, Gmünd.
Heidegger Wilhelm & Company, Pfortzheim.
Hertel C. & Son, Hanau.
Keller H., Pfortzheim.
King John Martin, Hanau.
Lay Edward, Pfortzheim (Lockets, &c.)
Plener & Co., Stuttgart.
Schehl C. W., Hanau (Etruscan).
Schonfeld Ernest, jun., Hanau.
Schwindt G. & Company, Pfortzheim.
Steinhener & Company, Hanau.
Weishaupt C. M., Solme, Hanau.
Wild & Company, Pfortzheim (Mourning).
Witzemann, Pfortzheim (Chains).
Lenner Hugo, Hanau and Berlin.
Zieher Ottmar, Gmünd.
Ascione Giovanna a Figlio, Torre del Greco (Coral).
Bellezzo Nicolo A., Rome.
Boucinnelli Giovanni & Son (and Mosaics).
Castellani Alessandro, Naples (Reproduction Antique).
Gallandt L. A., Rome.
Labriola Mariano, Naples (Tortoiseshell).
Mellillo Jacinto, Naples (Etruscan and Coral).
Adler V. A., Moscow, Russia.

Krumbugel Otto, Moscow.
Tchitchelof John, Moscow.
Balzani & Teifel, Vienna.
Goldschmidt Michael & Son, Bohemia (Garnet).
Kersch M., Prague (Garnet).
Markowitsch & Scheid, Prague.
Neushadt M. H., Prague.
Lee Ching, Canton (Gold Filigree).
Rolaksi Nicola, Trebizund (Gold Work).

JEWELLERS' CASES, &c.

Dennison & Company, New York.

JEWEL CASKETS.

Erhard & Sohne, Gmünd.

JEWELLERS' FINDINGS.

Kerr N. M. & Company, Philadelphia, Pennsylvania.

LAPIDARY WORK.

Bonet Louis, New York.
Cottier C. & Sons, New York.
Kraul & Bier, Hanau and Oberstein (Stones and Cameos).
Capannini Guisepe, Rome (Cameos).
Geraldini Ettore, Rome (Mosaic and Cameos).
Giozozza Gilbertini & Company, Naples (Corals).
Bergman Franz, Goblonz (Imitation Gems).
Goldschmidt Louis A., Dubnik (Opals).

METAL WORK (ARTISTIC.)

Elkington & Company, Birmingham (and Inlaid Metal Work).
Zuloaga Placido, Madrid.

MUSICAL BOXES.

Bremond B. A., Geneva.
Jacques Adank & Company, St. Croix, Switzerland.
Karrer & Company, Teufenthal, Switzerland.
Karrer S., Teufenthal, Switzerland.
Paillard C. & Company, St. Croix, Switzerland.

OPTICAL GOODS.**OPERA GLASSES &c.**

Bardon Fils & Company, Paris.
Darlot, Paris.
Lacombe, Paris.
Lemaire, Paris.
Voightlander & Son, Brnnswick.
Waldstein S., Vienna.

OPTICAL GLASS.

Feil Charles, Paris.
Chance Brothers & Company, Birmingham.

OPTICAL INSTRUMENTS.**SPECTACLES AND EYE-GLASSES.**

Spencer Optical Manufacturing Company, New York.
Wilson T. A. Reading, Pennsylvania.
Derogy, Paris (Achromatic).
Hoel J., Paris.
Lunetiers Societe des, Paris.

TELESCOPES.

Secretan, Paris.

SAFES.**BURGLAR AND FIRE PROOF.**

Chatwood's Safe and Lock Company, Limited, Bolton, Lancashire.

SILVER PLATE AND SILVER WARE.

Adams, Shaw & Co., Providence Rhode Island, U.S.A.
Derby Silver Company, Derby, Connecticut, U.S.A.
Gorham Manufacturing Company, Providence Rhode Island, U.S.A. (and Century Vase, Repoussé Work, and Plated Ware).
Holmes, Booth & Hayden, Waterbury, Connecticut, U.S.A.
Krider P. L., Philadelphia, Pennsylvania.
Manning, Bowman & Company, West Meriden, Connecticut.
Meriden Britannia Company, West Meriden, Connecticut.
Mix George I. & Company, Yalesville, Connecticut.
Reed & Barton, Taunton, Massachusetts.
Tiffany & Company, New York (and Silver Repoussé work).
Christoffe & Company, Paris (Statuettes).
Teill M., Paris (Exhibition).
Heller Florent Antoine, Paris.
Meurice Froment, Paris (Statuettes).
Elkington & Company, Birmingham (and Repoussé work).
Binder Wilhelm, Gmünd.
Gabler Gebrüder, Schomday (Thimbles).
Humbert & Heylandt, Berlin.
Koch & Beryfeld, Bremen.
Kitter A. & Company, Essington.
Soergel & Stallmeyer, Schu Gmünd (Thimbles).
Forti Emilio, Genoa.
Salvo C. & Sons, Genoa.

Chopin Felix, St. Petersburg.
Ivanhof N., St. Petersburg.
Khlebnikof, Moscow.
Owtchinnikof P., Moscow.
Postnikof Andreu, Moscow.
Semenof A., Moscow.
Sazikof Valentine, St. Petersburg.
Sazskof, Moscow and St. Petersburg (Repoussé).
Ho A. Ching, China.
Aurificia Lompaulna, Oporto, Portugal.
Cerquinho Francisco, Ang vas, Oporto, Portugal (Silver and Gold Filigree).
Lobao & Ferreira, Oporto, Portugal (Silver and Gold Filigree).
Mortinho Luiz Pinto, Lisbon, Portugal (Candelabra, Inkstands, &c.).
Forstrup J., Christiania.
Lie P. A., Christiania.
Olsen Theodore, Bergen (Ornaments).
Watson & Company, Bombay (Silver and Gold).
Steiner Henry, South Australia.
Wendt J. M., South Australia.
Christen N., Copenhagen.
Christesen V., Copenhagen (Repoussé).
His Highness the Bey of Tunis, Tunis (Ornaments).
National Museum, Cairo (Gold and Silver).

SILVER BRONZE.

Frattelli de Poli, Vitorio Treviso (Bell in Silver Bronze.)

TOOLS.

Stark John, Waltham, Massachusetts.
Borel & Courvoisier, Switzerland.
Vantier St. & Fils, Carouge, Switzerland.
Mark Servet J. Geneva, Switzerland.

VEST CHAINS, (ROLLED PLATE.)

Hamilton & Hunt, Providence, Rhode Island, U.S.A.

WATCHES.

American Watch Company, Waltham, Massachusetts.
Fortenbach Carlstadt, New Jersey (Cases).
Hietel, Brothers and Geister, Philadelphia, Pennsylvania.
Pequignot C. & A., Philadelphia, Pennsylvania, (Cases).
Robbins & Appleton, New York. (Cases).
Goudy J. B. & Company, Pontailier Doubs.
Haas B. Jun. & Company, Paris.
Haugard, Paris. (Springs).
Moat Eugene, Revig (Springs).
Frodsham, Charles & Company, London.
Nicole Neilsen, London.
Aubert Freres, Savagnier, Switzerland, (Main Springs).
Bachni Freres, Bienne, Switzerland (Balance Wheels).
Badollet John Moses & Company, Geneva, Switzerland.
Balhni Freres, Bienne, Switzerland (Main Springs).
Berlie Edward, Geneva, Switzerland (Springs).
Borel & Courvoisier, Neuchatel, Switzerland (and Pocket Chronometers).
Corcelle J. & Company, Geneva, Switzerland (Dials).
Frankfeld Louis, Geneva, Switzerland.
Francillon Ernest & Company, Longines, Switzerland.
Huguenin, A. & Sons, Locle, Switzerland (Escapements).
Humbert E. Locle, Switzerland (Decorations).
Jeanjaguet Charles, Neuchatel, Switzerland (Main Springs).
Klein E., Geneva, Switzerland (Main Springs).
Martin Charles & Company, Geneva, Switzerland.
Meylan Charles H. au Sauliat, Switzerland (Improvement in Chronograph).
Moutandon, Gentil, Lutz E., Geneva, Switzerland (Balance Springs).
Pateck Phillippe & Company, Geneva, Switzerland (and Parts).
Petitpierre Louis Bozet, Couret, Neuchatel, Switzerland (Tools and Instruments for Making).

Perret David Fils, Neuchatel, Switzerland.
Portales Ernest, Humbert (Cases).
Rauss Ami, Geneva, Switzerland (Dials).
Rigtrup R. S., Locle, Switzerland (Improvements).
Schmidt T. B., Bitterlin, Locle, Switzerland (Jewels).
Tagleib Carl, Zurich.
Lange A. & Sons, Glashutte.
Ungé V. T., Stockholm (Distance Watch for Military Use).

WATCH CASES (ENGRAVED).

Du Bois Edward Favre, Locle, Switzerland.

WATCHMAKING MACHINERY.

American Watch Company, Waltham, Massachusetts.

WATCH JEWELS.

Besancet Blanc, Eug., Travers, Switzerland.

WATCH WHEEL CUTTERS.

Ingold, P. F. Chaux-de-Fonds, Switzerland.

WATCH OILS.

Amblet & Poncet, Geneva.
Venchor L. Pesoux, Switzerland.

THE SCHLIEMANN DISCOVERIES.

DETAILED AND INTERESTING DESCRIPTION OF THE IMMENSELY VALUABLE TREASURES.

(Continued from page 152.)

THE Leipzig correspondent of the *Daily News* writes under the 9th December:—

"You will have a full account of the treasures found in the tombs at Mycenæ, as soon as Dr. Schliemann can leave the mouth of the rich mine which he has opened and change the pickaxe for the pen. The excitement at Mycenæ is great. Hundreds of people were present when the rock-cut tombs were opened and the treasures brought to light, one after the other. The Greek Government has thought it necessary to order the Governor of the Province to be present, and the Governor has required the presence of two more officials from Athens. All this causes trouble and delay, and Dr. Schliemann has no easy task with his navvies, and photographers, and officials, and governors—all buzzing about his trenches. No doubt he may be considered at the present moment the luckiest man in Europe; but it should not be forgotten how much in this glorious discovery is due to his tact, amounting almost to divination, to his perseverance, and to his generosity."

He also gives the following extracts of letters from Dr. Schliemann to him, dated Mycenæ, November 27th:—

"You will soon receive a more complete report; but, in the meantime, a foretaste of what is to come may be agreeable. In the same tomb of which I wrote to you in my last letter, I have just discovered what I take to be the skeleton of a woman, judging from the small teeth and the female ornaments with which the bones were covered. The two earrings are treasures in themselves. There were besides pendants of precious stones (red), hundreds of large and small leaves of gold, every one entirely covered with spiral ornaments and circles. When, after having dug out mountains of earth, I began to remove the stones and rubbish of the lower layer, I struck on the large gilded silver cow head (*sic*) with two golden horns, one large *δέπας ἀμφικύπελλον* of gold with a pigeon on each handle (who does not think of Nestor's cup?), three *δέπας* with only one handle, and an enormous vase of pure gold, richly ornamented. I found about 200 gold buttons, very large, and splendidly engraved, an immense golden *τελαμών*, richly ornamented, which I first mistook for a belt, nine silver vases, one or more of them gilded, ten very large vessels of bronze. All this was found before hardly one third of the tomb had been emptied. The bones which I found are like the bones of giants, of extraordinary size, and the teeth very large. There were close to them two large heaps of lances and swords of bronze. Many swords showed the remains of wooden handles, ornamented with innumerable gold pins (*χρυσόπυλον*). The handle of one sword was entirely of gold. There is no end of smaller objects, all of gold, which had been scattered over the richly-embroidered clothes of the Royal deceased. For instance, a man with a pigeon on his head, a sea-horse, a lion, a man whose physiognomy resembles the Medusa which Perseus kills on one of the bas-reliefs at Selinuat, two warriors fighting, &c. Here is an epoch of art fully recovered which was hitherto hardly known except by the three friezes in the British Museum. The tomb is the tomb which the tradition of the ancients assigned to the *ἄναξ ἀνδρῶν*, the *εὐρυκρείων Ἀγαμέμνων*, to Cassandra, to Enymedon, and their companions. I say no more at present.

"HENRY SCHLIEMANN."

The fifth and sixth instalments of his report on the previous excavations at Mycenæ, are:—

"My last letter was of the 7th inst., and I have continued the excavations ever since with the utmost vigour, employing constantly 125 labourers and five horse-carts. In the Treasury the difficulties were far greater than I anticipated, particularly as the delegate of the Greek Government opposed the removal of the foundations of a Hellenic house just above the lower part of the 'dromos.' Thus I have been unable to clear the latter of the rubbish, 9 feet deep, which still covers its pavement, and have only succeeded in clearing out the 13 feet long 8 feet broad passage of the entrance, and the central part of the Treasury, comprising a space of 360 square feet around which I leave a 9 feet high and 10 feet thick border of huge stones and rubbish. As soon as the Greek Government consents to the removal of the aforesaid ruin, which have not the slightest value to science, I shall at once do the remainder of the work, but certainly not sooner. The two columns, to the right and left of the entrance, were not quadrangular as I supposed, but fluted half-columns, one of which—4 feet 3 inches high, and 1 foot 4 inches broad—was found in the passage near the door. At 9½ feet before the latter the 'dromos' is shut up by a 5 feet high

wall of square calcareous stones. The door of the Treasury has the enormous height of 18 feet 5 inches, and is 8 feet 4 inches broad. On the threshold, which consists of a very fine calcareous stone, and is 2 feet 5 inches broad, I found a very thin round leaf of gold. The floor of the Treasury was covered with a coating of sand and chalk, traces of which are visible in many places; it slopes towards the centre, which is 1 foot below the threshold. There was found in the Treasury a large fragment of a frieze of blue marble, with an ornamentation representing a circle and a row of fishspines; further, five blades of bronze, 5½ to 6½ inches long, and a Juno idol, of the usual form, with two horns. Treasure may be hidden in the large border of stones and rubbish which I have been forced to leave behind, but I hardly believe it. Considering that very ancient fragments of pottery were found exclusively in the 'dromos,' and on the other hand a variety of potsherds of different ages in the Treasury itself, I feel convinced that only the 'dromos' and the entrance were covered up in high antiquity, that the Treasury remained empty, and that the fragments of vases now found in it were contained in the thick layer of rubbish which covered the upper vault when, fifty-six years ago, Veli Pasha, the son of Ali Pasha, tried to force an entrance by this way.

"In the Acropolis I have entirely cleared out the passage south of the Lions' Gate and brought to light the enormous threshold of the latter, which consists of a 15 feet long, 8 feet broad, very hard calcareous block. The ruts caused by chariot wheels, of which all guide-books speak, exist in the imagination of enthusiastic travellers only, but not in reality. The different monuments which I have brought to light in close proximity to the Lions' Gate, such as the immense double parallel row of closely-joined slabs, the gigantic sepulchres, &c., have, since a very remote antiquity, barred the access of chariots to the Acropolis. No doubt the fifteen small, straight, parallel furrows, which are cut all along the threshold, have been mistaken for ruts of chariots. The opening of the gateway widens from the top downwards, it is 10½ feet high, and the width of the door is 9½ feet at the top and 10½ feet below. In the 15 feet long and 8 feet broad lintel are the 6 inches deep holes for the hinges, and in the two uprights, which it covers, are four quadrangular holes for the bolts or bars. There is a 1 foot 3 inches long and 1 foot broad quadrangular hole in the midst of the threshold, where the two wings of the gate joined. The threshold further shows on its east side a 1 foot broad, artificially cut, straight furrow, and on its west side another which forms a curve; both seem to have served as channels for the rain-water, the rush of which must have been great, the threshold being lower than the rock of the passage, which gradually rises. In the side of the threshold which faces the north is a long artificial hole of a peculiar form, which in some way or other must have been connected with the gate, for a cutting of perfectly the same form exists in the large flat stone in the midst of the Scæan Gate at Troy. On the suffix of the gate stands a triangular slab of gray calcareous stone, 10 feet high, 12 feet long, and 2 feet thick, upon the face of which are represented in high relief two animals, hitherto thought to be lions, standing on their long stretched hind legs, and resting with their fore paws on either side of an altar, in the midst of which is a column, which becomes broader towards the top, and has a capital ornamented with four circles, enclosed between two horizontal fillets. This ornamentation is peculiar to Mycenæ. The general belief that the heads of the two animals are broken off is wrong, for on close examination I find that they were not cut out of the same stone together with the animals, but that they were made separately and fastened on them with bolts; most probably they were of bronze and gilded. The straight cuts and the borings in the necks of the animals can leave no doubt that they were put in separately. Owing to the narrowness of the space the heads must have been exceedingly small, and must have been facing the spectator. As stated in my first letter from Mycenæ, the great resemblance of the horned animal in one of the bas-reliefs in the Acropolis to the animals on the gate makes me believe that the latter were also fantastical animals with horns. At a distance of 11½ feet from the threshold is on either side of the passage, as in Troy, a quadrangular cyclopean masonry, 2 feet broad and high and 3 feet long, which marks the site of a second gate of wood.

"Mycenæ.

HENRY SCHLIEMANN."

Dr. Schliemann, under date Mycenæ, November 28, continues the account of his great discoveries with the following interesting details:—

"I continue the description of the jewels, &c., found with the five bodies in the fourth tomb. Among the most interesting objects of this sepulchre, I reckon the magnificently ornamented golden buttons. Twelve are in form of a cross, and one of them is 2 1-5 inches large and 3 inches long; three are somewhat smaller, and the remaining eight are of a still less size. Of

splendidly ornamented round gold buttons were found in all 216, two of which are 2 inches in diameter, seven are of the size of a five franc piece, and 207 are still smaller. All these buttons, the lower part of which consists of a bone-button in form of our shirt-buttons, must have served on the clothes of the deceased, whereas all which show below only a flat piece of bone or wood have evidently served to decorate the sheaths of swords, lances, &c., to which they had been soldered with tin or otherwise fastened. There were in all found in this tomb 25 two-edged bronze swords, 16 of which are in a perfect state of conservation; four of them had handles plated with gold and richly ornamented. There were also found with the swords five large handle-buttons, four of which are of alabaster and one of wood; all of them are ornamented with golden nails. Further, two golden shoulder-belts, which were worn on the shoulder across the breast; both are 4 feet long and 1 3-5 inches broad. There were further found two large golden girdle-belts, ornamented with circles and flowers; one of them is composed of two pieces. There was also found part of a similar belt and a child's golden girdle-belt, only 1 foot 4 inches long, and 2 1-5 inches broad. Further, a splendidly ornamented large golden handle, probably of a sceptre. It terminates in a dragon's head, whose scales seem to have been imitated by square pieces of rock crystal, which are inlaid like mosaic. There were also seven large and one small golden diadems—one of the former is ornamented with golden leaves. All of them show splendid ornaments of circles and spiral lines." Further, four golden ornaments of the *knemides* (greaves) almost in form of a bracelet; one comb of bone in a large handle, or casing of gold, of the usual form, as ladies wear it; one enormous, most magnificently-ornamented, massive golden bracelet, weighing 360 grammes. In the centre of the ornamentation of this bracelet is soldered a separate piece of gold, representing the sun with his rays. The size of this bracelet is so enormous that the person who has worn it must have had gigantic arms. It may have been worn on the legs. Quite in opposition to the size of the bracelet are two massive golden seal rings, the opening of which is so small that they would only fit a child of ten years. I therefore suppose that they may have been used as seals only. One of the seals represents two warriors on a two-wheeled chariot with two horses which seem to run at full gallop; one of the warriors is holding a bow in his hand and has just shot an arrow at a stag. The stag is wounded, and in anguish turns his head. The other seal ring represents a warrior who has just vanquished his three enemies, and is in the act of giving with his uplifted sword a last blow to one of them wounded and kneeling before him on one knee; the latter tries to parry the blow with his uplifted hands and with a lance, which he holds in his right, and seems to throw at his opponent. Another seems to be mortally wounded, for he lies on the ground leaning on both his hands. The third, who alone of all the four warriors, has a helmet with a crest on his head, is flying under the cover of an enormous shield which reaches from his neck to his heels; but still he turns his head towards his victorious enemy, and is in the act of throwing a lance at him. The anatomy of all the men is so well observed, their posture is so faithful to nature, and everything is executed with so much art, that, when I brought to light these rings, I involuntarily exclaimed, 'The author of the Iliad and the Odyssey can only have been born and educated in a civilization which could produce such wonders. Only a poet who had masterpieces of art like these continually before his eyes could compose those divine poems.'

"At the head of one of the bodies was found a large and heavy golden helmet, but it had been much crushed, and had become nearly flat under the ponderous weight which pressed upon it. In its present state it is difficult to describe it. On its forepart the openings for the eyes and mouth, as also a protuberance, ornamented with small stars, are distinctly visible, as also, on the top of the helmet, the tube for the crest. The back part is beautifully ornamented with an imitation of the hair. The face of the same body was covered with one of the golden masks mentioned in my last letter, and its breast and sides by a 1 foot 8 inches long and 1 foot broad, thick plate of gold, which was no doubt intended to represent the coat of mail. There were further found one hundred leaves of gold, either of circular or of crosslike form, with impressed ornamentation, consisting either of spiral lines or of circles. Further three very heavy golden breastpins, of which the one is 5 1/2, the other 5, and the third 4 1/2 inches long. The last is crowned with a ram, the two others with an ornament in shape of a helmet, and the heads of all the three breastpins are perforated, probably to put in a flower. There were

further found two masterly ornamented objects of massive gold in the form of crosses; also a large golden vase weighing 1 1/2 kilogrammes; it has two handles, a large foot, and is ornamented with three upper and two lower parallel lines, between which is a row of fourteen stars; further a large golden vase with one handle and an ornamentation representing seven beautiful flowers; another golden vase with two handles; further a splendid little golden *amphora*, or wine can, with an ornamentation of spiral lines. Further, six golden drinking cups, one of which is a *depas amphikypellon* with two handles, on each of which is a pigeon, each of the two handles being joined to the foot by two separate golden blades. This goblet reminds us of Nestor's goblet, which was also ornamented with pigeons (see Iliad XI. 632-635). One of the other goblets is ornamented with parallel flutings. There were further found two small golden vessels; also eight silver vases, three of which are admirably conserved; one of the other five has the bottom and the mouth of bronze; below its bottom were found 100 of the aforesaid golden buttons. I further found in this tomb thirteen large bronze vessels. This kind of vessel was in high esteem in the heroic age, and we see them continually mentioned by Homer as prizes in the games. I suppose that to each hero were given in the grave the goblets and other objects which were dear to him in his lifetime, having been won by him in the games, or having been given to him by his host as a pledge of hospitality and friendship. There was also found a large quantity of small perforated amber balls of necklaces and a bronze or copper fork with three teeth, which had probably served on the funeral pyres. There were further found thirty-five arrow heads of obsidian. Nothing could give a better idea of the great antiquity of these tombs than these stone arrow heads, for the flint seems to know only arrow heads of bronze (e.g. Iliad XIII., 650 and 662). Probably there had also been deposited bows and quivers in the tomb, but they would have been of wood, and would have rotted away. To my greatest regret, among the thousands of gold ornaments there is not even a single sign resembling writing, and it therefore appears certain at the sepulchres belongs to an epoch which preceded the introduction of the Phœnician alphabet. Had the latter been known, the Mycenaean goldsmiths, whose continual efforts appear to have been directed to the invention of a new ornamentation, would have been very ambitious to show the novelty of the alphabet. A second proof of the immense antiquity of these tombs is the entire absence of any vestige of either iron or glass, or of any pottery made on the potter's wheel. But the hand-made pottery had reached a high degree of perfection, such as has never been attained here in later times by the pottery made on the wheel."

Dr. Schliemann has addressed the following letter to the King of Greece:—

"With unbounded joy I announce to your Majesty that I have discovered the monuments which tradition, as related by Pausanias, points out as the tombs of Agamemnon, Cassandra Eurymedon, and their companions, who were all killed whilst feasting at a banquet, by Clytemnestra and her lover, Ægisthus. These tombs are surrounded by a double parallel circle of tablets, which were undoubtedly erected in honour of these great personages. In these tombs I have found an immense archæological treasure of various articles of pure gold. This treasure is alone sufficient to fill a large museum, which will be the most splendid in the world, and which in all succeeding ages will attract to Greece thousands of strangers from every land. As I am labouring from a pure and simple love for science, I waive all claim to this treasure, which I offer with intense enthusiasm in its entirety to Greece. Sire! may these treasures, with God's blessing, become the corner-stone of immense national wealth.—Mycenæ, Nov. 28, 1876."

THE GREENWICH TRIALS FOR 1877.

THE Astronomer Royal announces that the last day for the deposit of chronometers at the Royal Observatory for the forthcoming annual trial will be Monday, February 5. Chronometers for trial will also be received on any day of the preceding week. Application for permission to send chronometers for trial must be made to the Hydrographer, Admiralty, London, S.W., by Jan. 15th

THE trustees of the British Museum have purchased for the sum of 2,000*l.* an antique bronze statue, rather more than half the size of life, representing a bearded Baechante dancing.

THE Watchmaker, Jeweller, and Silversmith,

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SPECIAL NOTICE.

THE ANNOUNCEMENT IN THE LAST NUMBER OF THIS JOURNAL THAT MR. L. SCHIFF HAD DISCONTINUED HIS CONNECTION THEREWITH IS HEREBY RESCINDED, AND THE SAID GENTLEMAN CONTINUES TO REPRESENT OUR OFFICE AS HERETOFORE.

IN future copies of the WATCHMAKER, JEWELLER, AND SILVERSMITH, will be supplied to the Retail Trade, Booksellers and Newsagents, by Messrs. Catty and Dobson, Wholesale Booksellers, 1, Ivy Lane, Paternoster Row, London.

PATENTS.

Application for Letters Patent.

4811. JOHN COMPTON WEEKS JEFFERYS, of Tottenham Court Road, in the county of Middlesex, Manufacturing Jeweller, for an invention of "Improvements in studs, solitaires, purses, clasps, gloves, bags, harness, and other fastenings or ornaments for dress."—Dated 13th December, 1876.
5002. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake and Co., Patent Agents, Southampton Buildings, London, for an invention of "An improved machine for engraving and chasing jewellers' and silversmiths' work, and for other like purposes."—A communication to him from abroad by Albert H., Watkins.
4949. EZRA HATTON, of Alexandra Street, in the city of Manchester, Ornamental Metal Worker, for an invention of "A new optical instrument for producing designs and for other purposes, the hinge-forming part of which may be used in other appliances."—Dated 19th December, 1876.
4906. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, and Co., Patent Agents, Southampton Buildings, London, for an invention of "An improved telescope."—A communication to him from abroad by Carl Fritsch and Joseph Forster, both of Vienna, Austria, Dated 22nd December, 1876.

Grants of Provisional Protection for Six Months.

3785. To GEORGE EDWARD PRITCHETT, of 39, Lombard Street, in the city of London, Architect, for the invention of "New or improved means, apparatus, or appliances for utilising clocks, clock-work, or time-keeping movements, so as to put the same in communication with distant buildings, rooms, ships, mines, or places."
4811. To JOHN COMPTON WEEKS JEFFERYS, of Tottenham Court Road, in the county of Middlesex, Manufacturing Jeweller, for the invention of "Improvements in studs, solitaires, purses, clasps, gloves, bags, harness, and other fastenings or ornaments for dress."

Notices to Proceed.

2975. GIUSEPPE ZAFFIRA, of Pentonville Road, in the county of Middlesex, Engineer, has given notice in respect of the invention of "Improvements in the up-and-down movement for watches, chronometers, and spring clocks."—As set forth in his petition, recorded in the said office on the 22nd day of July, 1876.

3264. ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, has given notice in respect of the invention of "Improvements in dynamo-electric and magneto-electric machines."—A communication to him from abroad by Diewdonne Francois Joseph Lontin, of Paris, France.
3309. CHARLES HARROLD, of Birmingham, in the county of Warwick, Refiner and Metal Roller, has given notice in respect of the invention of "Improvements in the manufacture of watch pendants and in tools or machinery employed in the said manufacture."

Patents Sealed.

2458. WILFRED CAMMACK and ROBERT CAMMACK, both of Ormskirk, in the county of Lancaster, Watch Makers and Jewellers, for an invention of "Improvements in dress fastenings."—Dated 14th June, 1876.
2865. ALBERT WILLIAM JONES, of Camden Town, in the county of Middlesex, and HARVEY CHAMBERLAIN, of Hamsel Street, in the City of London, for an invention of "An improvement in solitaires and studs."—Dated 13th July, 1876.
2797. ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the county of Middlesex, Patent Agent, for an invention of "Improvements in watches."—A communication to him from abroad by Vve. de J. Soldano, fils, of Geneva, Switzerland.—Dated 22nd June, 1876.
2797. ALEXANDER MELVILLE CLARK, of Chancery Lane, in the county of Middlesex, Patent Agent, for an invention of "Improvements in keyless repeating watches."—A communication to him from abroad by Ami Louis Junod-Pattus, of Paris, France.—Dated 8th July, 1876.

Patents which have become Void.

3945. BENJAMIN HAAS, junior, of 104, Boulevard Sebastopol, Paris, France Watch and Clock Manufacturer, for an invention of "Improvements in watches."—Dated 2nd December, 1873.

Patents Granted in Foreign States.

PRUSSIA.

22. F. BACHSCHMID, of Kempten, Bavaria, for "A pendant remontoir and regulator for watches."—3 years.—Dated 20th October, 1876.

BELGIUM.

- 40,819. WOLF-HIRSCH, for "A clasp for earrings."—Dated 10th November 1876.
- 40,900. J. A. LUND, for an imported invention of "Means of and apparatus for timing different clocks."—Dated 21st November, 1876. —(French Patent, 17th November, 1876.)
- 40,912. J. CARPENTER & G. MARTIN, for an imported invention of "Improvements in clocks and other time-keepers."—Dated 22nd November 1876.—(French Patent, 18th November, 1876.)

FRANCE.

Certificate of Addition.

- 107,021. BEAULAYON, for "An isochronous compensating pendulum for clock-work."—Dated 16th August, 1876.
- 114,199. FYFE, for "Improvements in ladies' dress suspenders."—Dated 18th August, 1876.—(English Patent, 23rd June, 1876.)
- 114,252. THOUVENIN, of Nancy, for "A lathe for cutting the rims of watch-glasses."—Dated 26th August, 1876.
- 114,277. MORLET, for "A calibre for watches."—Dated 27th August, 1876.
- 114,298. DEVIENNE, of Lille, for "An electric contact apparatus with an adjustable prolonged rest and its receiver dial applicable to all clocks."—Dated 30th August, 1876.
- 114,326. FOULBOEUF, for "Manufacturing false brilliants."—Dated 28th August, 1876.
- 114,341. PROZ, for "Imitation of lapis lazuli for jewellery, trinkets, stationery, &c."—Dated 26th August, 1876.

UNITED STATES.

- 176,231. HENRY A. LUGRIN, of New York, N.Y., for "Stop-watches."—Application filed 25th March, 1876.
- 176,309. JOHN W. HILE, of Waterville, Kans., for "Clocks."—Application filed 29th March, 1876.
7057. W. B. TUCKER, of Hillsborough, Ohio, for "Watch-regulators."—Patent No. 68,324, dated 27th August, 1876,—Application filed 25th April, 1872. (Re-issue.)

IMPROVEMENT IN DRESSHOLDERS.

MESSRS. L. JACOBS & SONS, of Caroline Street, Birmingham, have recently patented an improved dressholder having many advantages over all others hitherto introduced. Besides the various improvements, the newly patented holders are manufactured in various styles and in handsome designs, and will doubtless supersede many others now in use.

A SERIES OF PRACTICAL LETTERS ON EXISTING ILLS IN THE WATCH TRADE.

(Translated from the German of Seb. Geist.)

PRACTICAL business among Watchmakers is carried on in so many different ways, that it is worth while to give it some little consideration. If we look back to years past, we shall find, here and there, signs of the good old times, when watchmakers manufactured for themselves all they wanted, and naturally then, as now, some excelled, many did not even come up to the mark in common workmanship. If we find among the earlier watches more good ones than among the modern, it is only a proof that the bad ones have disappeared long ago. One advantage of the earlier period was, perhaps, that then the hammer, file, and lathe were more used, whereas now watches are "looked into, half-repaired, and brushed up." In the same manner as business spreads itself out in manifold and totally different branches, both by wholesale manufacture and division of labour, and increase of capital, so matters lie now in the present state of watchmaking, that working in the former style is not to be thought of any more. Nevertheless, it daily happens that some part of the watch gets out of order, which only an experienced and clever workman can repair or replace by an entirely new piece, and it is not to be denied that it is often more difficult to repair a piece of the merchandise than to manufacture it anew. It would not be of so much consequence, if the number of repairs were limited, so that many would be in constant repetition; but every expert knows from experience, that similar repairs very seldom repeat themselves. If practice makes perfect, where is it to come from in this case? Besides, watch parts are now made by specialists, with special appliances, so that the most experienced workman has but a poor chance of doing justice to his work. If it is difficult to do the several works really well, it remains much more difficult for many even to get work; for the limitless competition which is caused by overproduction, throws things, wrongly termed watches, by the bushel into the market.

These so-called watches wander out of the hands of their makers into the workshop of the watchmaker, where they take up their abode for a long, long time, awaiting chance to get them another atmosphere. It is natural, of course, that on setting such a watch in motion, an earnest examination of its construction, or of the regular quality of its parts, according to the proportion of its size and hardness, is never thought of. They are glad if all "looks well," i.e., as long as the cylinder is not too large, or the nailing (for soldering would be too much) has not made an injury on the lower end, so that a catch be impossible, and a position being arrived at, they are perfectly satisfied, as long as the dial does not look worse than that of a common clock of the Black Forest.

The spring must, of course, be repaired at once, the spring box with holes, which are too broad, runs about as round as a three-cornered hat, and touches the sides of the plate. Then comes the minute wheel, which besides the injuries mentioned, is upon a spring which is either much too large or too small. Even if this be remedied, then come the remaining wheels and motors, which have similar defects, in short, the art of the watchmaker is, as with Odysseus of old, to get cleverly through between "Scylla and Charybdis." Let us be quiet on the subject of the movement, and say a silent prayer for that unhappy one who has the misfortune to have to repair such a watch, and especially when he requires the help of others. How much to be preferred is the lot of the cobbler! the worse the leather out of which he creates his wonders, the easier does he pierce the noble stuff with his awl, and when the hole is closed, he smears a certain black substance over it, and his misfortune is at an end where the watchmaker's commences. For, when the watch is ready, it comes into a thin, but tight fitting case, which, as soon as the thumb nail is able to open it without splitting all the way up, springs open by itself, never to close again. When this creation is "finished," it carries, in truth, the marks of its martyrdom on the forehead, looking with a pale, moonshine face, forward to its pains and travels in this world, which mostly fall upon the unlucky watchmaker.

Opposition and competition, and the principle of selling, "anything to anybody at any price," force the sellers of these watches to put a price on their articles, which is dear enough for such a prodigy of badness, but always assures them of a customer. The societies of watchmakers which have been formed are the first step towards finding a remedy for this morbid symptom in the trade, and what has been done, must be further done, namely, the attention of the unwary must be called to the trap they are falling into. Really good watches must only be sold, and the bad ones must remain in the hands of the pedlars. By these means the situation is ameliorated, and the honour of the "Guild" kept unsullied. It is a bitter deception of many to think that they raise the business

situation by selling cheap wares. The greatest consideration and advantageous institution is that of a society of just and upright watchmakers.

All, or most productions of modern industry, are manufactured wholesale, and by division of labour. Any single workman need know only one branch, or have, at least, considerable less knowledge and experience than the watch repairers, and the intelligent among the former command much higher wages, and proportionately less knowledge than the workmen who are repairers, and naturally so, because the proprietor earns less. The saying, "the more delicate the work, the worse the pay," is certainly true. Considering only the expense of the tools, what other costs are incurred? When we consider again how subtle these things are, and how difficult it is to handle them, we see at once what a number of acquirements are necessary, which other trades do not want. If a commencement were made of work being paid according to the real trouble incurred, it would be the first link of a chain which would lead to what we want. But such is not yet the case. The same young man, who, for instance, lines holes, makes catches, or arranges stones and movements, is expected to clean the most miserable Black Forest apologies for clocks. This he is required to do as his daily occupation, and it is only on holidays that, as a special treat, his intelligence is put to the test on a good watch, so that he is like a musician who can play the majority of instruments and at the same time—tread the bellows at the organ. In this light the public look at the watchmaker. They think it is easy enough to repair a watch, however bad the defects may be, because, they say, the new pieces' come from the factory, and only have to be put together; they give a watch, and receive one back, but must not be able to detect that any repair has taken place. This shows us that watchmakers are in no enviable position, and that they are justified in saying that they have a difficult business, and little pecuniary profit. But no help appears by the mere enumeration of these morbid symptoms, although it may perhaps excite and encourage us to mutual trials and exchanges of opinion, in order to find out those remedies which at the end must be discovered.

The list of these remedies is headed by the societies which have already been formed on the continent, and which count among their members influential and conscientious men of the trade. Then comes the faithful keeping of the laws and regulations of the watchmaking world, and the general abiding by the tariff once set up for all work and repairs, and lastly and specially, a more intimate relation between the several manufacturers, repairers, traders, and workmen throughout the world. It is an honour to belong to a respectable society, and those who exclude themselves show blind egotism, or are wanting in prudence. Earnest members of the world at large will readily have a better opinion of our branch, as we strive not only to insure our existence in an honest and honourable manner, but also to further the interests of the public, so that "Cheap and bad" can have no reference to us. Wherever we look, we see great results from combined action, but a single man, if he be the best, will evince but little success. It is true the "Guilds" in the latter periods have not been what they ought to have been, but then they were only the distorted copies of the original, which was and is a society of honest, earnest, and honourable men of the branch, who strive in just manner for equality of interests, in order to work in a closed phalanx, and with a formidable front, against such pitiable creations and creators of the present day. We have already roused many societies to action, and various important subjects have been discussed by and laid before the conferences now taking place in nearly all parts of the world. We strive to bring about amelioration of the state of apprentices, better instruction, voluntary examinations, and legally made out certificates, in which not only technical knowledge, but also the general character, receives due attention. In this way the steady and earnest meaning workman only can get into suitable places, and in this way we assure ourselves of honourable successors. A visiting inspector, of really conscientious character, a good and solid workman, of experience and sound knowledge, might on his tours work wonders among the trade. As it is in the interest of every watchmaker to find well-educated apprentices and workmen, it would be well to salary such visiting inspectors. The profit by having and knowing how to use well the necessary instruments, by being able to compare the different ways of repairing, used in the different countries, is not to be overlooked. Proprietors have seldom time to attend to each workman, so that these often bungle about a repair for hours, not knowing how or where to commence. As things are now, a system of reform is very necessary. When we consider the number of men in the trade who are well-known celebrities, able and willing to lend a helping hand in all good, we may hope that proper reforms will be instituted at no distant date.

To be Continued.

THE WATCHMAKER, JEWELLER, SILVERSMITH, AND KINDRED TRADES' DIRECTORY.

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NEWMAN, JAMES THOMAS, 42, Spencer Street, Gos- well Road, London, E.C.
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HOROLOGY.

XXI.—THE ANCIENT WORLD ON THE DIURNAL MOTION.

THE people of the ancient world who lived before the Christian era, may be said to have had their own peculiar notions about the globe that they dwelt on. They, some of them, believed that the earth was a flat surface, resting upon supports, that they comforted themselves extended to infinity. These people were known as the Epicureans, but in their scheme it never occurred to them how the sun, the moon, and the stars were always in their places every morning and every night to continue their regular operations. It never seemed to have appeared to them that if the earth was a solid immovable body, resting upon unfathomable supports, how did the luminaries just mentioned manage to resume their places again? How could they have passed under this solid body and its unmeasurable propwork? The generations named saw the sun rise in the east and set in the west every clear day, just as we do; they saw the moon rise and disappear, and the stars do the same; yet, with their solid flat surface and supports theory, how did sun, moon and stars contrive to get back to the starting point? The good Epicureans never troubled their heads about that; but somebody else, much to their annoyance, did for them. They did not escape the penalties of the obstinately crochety, any more than we do now. The stars have to be extinguished when done with, carried back and made returnable for work each night. In the time of Augustus, one Cleomedes, a philosopher, could hold himself no longer, so he opened fire upon the Epicureans, and here is a specimen of his style.

"These immense absurdities have for their foundation the tale of

an old woman, according to which the Iberians heard every evening the hissing noise made by the incandescent sun as it was extinguished like a red-hot iron in the waters of the ocean."

From this, one thing appears clear, namely, that there were both old women, and old women's tales in the world some 2500 years ago, as well as there are now. The ancient observers could not persuade themselves that a body like a star could remain suspended in space without falling; and that idea is said to have given rise to what were called the "solid spheres." And that belief of solid spheres continued through many ages of the ancient world, defying all the attacks of opposition, as many equally foolish beliefs do at the present day. A philosopher named Anaximenes, who lived about 543 years before Christ, gave it out that the heavens were composed of solid crystal, into which the stars were driven like so many nails. Anaximander and Pythagoras looked upon the firmament as a solid vault in which the stars were set. They must have borrowed the idea from the Persians, for the Zend-Avesta states that the most ancient astronomers of the then known world firmly held by the doctrine of an embossed solid heavens. Aristotle has been credited with this highly poetical fancy of solidity in the sky, but it was believed in centuries before his time; he only concurred in it, his high character being considered of paramount importance. He improved upon the theory. The sphere of the stars was, according to him, the eighth heaven; the solid spheres were less elevated, and they served to explain, according to the astronomy of the time, the proper motions of the sun, moon, and the planetary system. The eighth solid sphere was uniform in its composition, and no disturbance ever affected it.

"In the interior of the universe there is a stable and immovable centre which Fate has given to the earth. . . Beyond the universe, there is a surface which terminate on all its sides, and

in all directions. The most elevated region of the universe is called the heavens. . . . It is filled with divine bodies, which men call by the name of stars; and it revolves with an eternal movement, bearing along with it those immortal bodies, which always pursue harmoniously the same course, without interruption and without end."

Even Euclid, our own grand Euclid, with all his incomparable knowledge of angles, curves, and circles, believed that the stars were eased in a solid sphere, having the eye of the observer for the centre; and this was his reasoning, exact if the premises had but been true:—"The revolution is performed as if the stars all formed one entire piece: it does not alter at any epoch of the day, either the form or the dimensions of the constellations."

Such were the opinions that were held about 300 years before the Christian era.

After Euclid came Cicero, the celebrated orator, who lived in the century before Christ. He declared himself of the opinion that the heavens were solid. He could not otherwise determine how motion could be given to the stars. During the time of Seneca, that philosopher threw doubts upon the solid theory, by asking:—"Are the heavens solid, and composed of a firm and compact substance?" After that came the idea of the stars describing circles in virtue of the diurnal position, and Geminus, a contemporary of Cicero, mentions an instrument called a Dioptra, turning about an axis parallel to the celestial sphere. that gave some assistance towards proving the position put forward. This dioptra must have been connected in some way with the refraction of light, for its name comes from the Greek of *dia*, through, and *optoma*, I see. Old writers classed dioptries as the third branch of optics, and belonging to telescopes and microscopes, all beside our present subject.

Modern astronomers, however, have followed this dioptra of Geminus up with some considerable success. Arago says that the means employed were excellent, and that the dioptra of the ancients is the splendid instrument of the present day, known so widely as the equatorial.

In due time the ancient astronomers had an axis of the celestial sphere; but their idea of it was very different from ours. They held that the revolution of the universe was, in reality, a grand, omnipotent, mechanical operation; that is, that there was a solid axis, wonderfully pivoted and working in fixed sockets! The learned Frenchman adds, that no person can entertain the slightest doubt on this subject after having read the words of Vitruvius. Well, he may be taken to be a good authority on his subjects; and this is what Vitruvius says:—

"The heaven is that which turns about the earth and the sea in an axle-tree, the extremities of which support it like two pivots; for in both these parts the power which governs nature has fabricated these pivots, and made them like two centres, one of which ascends beyond the earth and seas to the region of the northern stars; the other extends in the opposite direction under the earth towards the south; and about these pivots, as about two centres, small naves are placed, similar to those of a wheel, upon which the heavens turn continually."

Such was the belief of the greatest architect that the pre-Christian era produced. When we consider that Vitruvius wrote a most able treatise on his own profession, which he dedicated to the Emperor Augustus, and that it is the only architectural book extant of that period, we may form some opinion of the state of astronomy in the century preceding the Christian era. But with respect to their belief of the stars being set in a solid sphere there is this much to be said, the ancients had no observing instruments of any real scientific value. It was then quite natural for them to speak of the "solid heavens;" and for these reasons:—As far as the naked eye can determine, the stars do seem to move in the celestial sphere as though they were fixed in something solid. They rise in the east, and set in the west, as we notice them every evening when the sky is clear. We see them in the same places night after night, and hour after hour; their altitude varying continually with the hour of observation.

Now this general movement of the stars from east to west forms one of the fundamental bases of the higher horology—it is in fact the diurnal motion.

CEYLON PEARL FISHERY.—There will be a great pearl-fishery in Ceylon, on account of the local government, on the 5th of March. The Colonial Secretary advertises for divers and boat owners and promises employment to fifteen boats for fifteen days, at one of the places where the oysters are to be fished up, and occupation to the same number of boats for one day in the other.

AMERICAN GOLD AND SILVER MINES.

REFERRING to the gold and silver mines of America, the *Daily Chronicle* says that the gold yield of California this year will probably be about 20,000,000 dollars, or as much as it was in 1875. Of this two-thirds may come from placer claims, and the remainder from quartz. The greater part of the placer gold is obtained by hydraulic means in the channels of dead rivers, with deposits of auriferous gravel several hundred feet deep and a quarter or half a mile wide. Although many acres of deep gravel beds have been washed away to the bed-rock, large areas remain, and promise to yield a good profit for many years to come, though the product will doubtless decrease gradually. The placer mining camps which have no hydraulic washings are steadily declining. The gold quartz mining industry of California is stationary in its general character. A large number of auriferous lodes, and even of mines partly opened, are neglected because the gross average yield per ton will not exceed 10 dollars, and that figure does not, in most cases, leave any profit; though in Australia, where labour costs half as much, and supplies are cheaper, many quartz mines are kept going for a gross yield of 5 dollars per ton. The yield of the gold mines generally, unlike that of the silver mines, is not published regularly. Many gold mines are worked on a small scale, sometimes by two or three men. Few of them are incorporated in San Francisco; the stockholders are usually few, and live at the mine; they can get information by letter or orally; and, as the treasure is much more attractive to robbers than silver, the managers try to keep the amount of production and the times of shipment secret. In reference to a number of the most productive quartz mines of California it is impossible to get information for publication. The silver yield of Nevada has been larger this year than ever before. The Consolidated Virginia has continued to pay its monthly dividend of 1,080,000 dollars, commenced in February, 1875, and in May, 1876, its companion mine, the California, began to reward its stockholders at the same liberal rate; the two now yield 25,000,000 dollars net, and 37,000,000 dollars gross a year, and most of the former sums goes directly into the pockets of the San Francisco stockholders. It is asserted by persons supposed to have good sources of information, that a large body of very rich ore has of late been found in the lower levels of the Consolidated Virginia, and that it extends into the adjacent Best and Belcher mine. If this be true, this bonanza will, at no distant time, pay dividends to three companies at least, possibly to more. The opening of a large body of ore in the Justice indicates the situation of the lode south of the Overman, a point about which there was previously much doubt; and other discoveries, whispered about in confidence, if correct, will show that the rich portion of the lode extends considerably beyond the Ophir on the north and the Belcher on the south, and raise the hopes that other bonanzas will come into competition with the ore now worked in the limits of Virginia City. The mining districts of Nevada generally, with the exception of the Comstock Lode, are under a cloud. Eureka has probably not produced one third so much bullion in the first ten months of 1876 as in the corresponding period of 1875. The decline in the price of silver, a strike among the miners, the exhaustion of the rich ore bodies in some of the mines, and the increasing cost of charcoal on account of the scarcity of wood, contributed to the stoppage of work.

NEW CLOCK AND CHIMES AT HIGH WYCOMBE.

A NEW clock and chimes have just been completed and fixed in the tower of the parish church, High Wycombe, by Messrs. Gillett & Bland, of West Croydon. The clock has four dials, each 6 feet 6 inches in diameter, and chimes the quarters, halves, and hours; the tenor bell on which the hours are struck, weighing 23½ ewt. The frame is made of solid cast iron on the horizontal plan, and is so constructed that any separate wheel can be taken out without disturbing the other parts. The pendulum is a self-acting compensating one, made of zinc and iron tubes, so that under variations of temperature, they may act against each other, and keep the rod the same length. The four pairs of hands are driven by level wheels above the clock, connected to the separate systems of motion wheels behind each dial. The weights to drive it weigh nearly one ton, and are suspended from the three iron barrels by steel wire lines. There is also a very ingenious piece of mechanism fitted to the clock, called a self-acting gas apparatus, for turning the gas on and down automatically, so as to suit all seasons of the year, which will effect a very considerable saving in gas. The clock is one of the largest in the county, and contains all the recent improvements and inventions. The *Wycombe Telegraph*, of the 19th ult., devotes an entire leading article to the praise of the clock, giving a detailed description thereof.

IMPORTANT IMPROVEMENT IN TIMING CLOCKS BY ELECTRICITY.

IF "time is money," London must have made a great mistake about its riches, for with a few notable exceptions its public clocks vary so as scarcely to show like time on any two of them, in fact the wonder is that with the well-known facts before practical men of the inherent defects which the effects of heat and cold produce upon the length of pendulum, elasticity of pendulum spring, and condition of oil, uniformity could be expected by them amongst a number of timekeepers when no effort at compensatory adjuncts is made, adjuncts which have taxed the best powers of horologists to perfect, in order that the ordinary clock with its inevitable defects might be corrected and adjusted to become the perfect astronomical instrument; facts, self-evident, well-known, stubborn facts, ought to have taught us long ago, that for the exigencies of such demands as are now made upon the accuracy of our clocks, some kind of instrument needed to be devised to keep them set to true time. At Paris, Edinburgh, Dublin, and elsewhere, efforts, with some measure of success, have been made to secure uniformity of time in some of the clocks, but though last in the field, London will, probably owing to the exertions of a private firm, assisted by the General Post Office, at last relieve itself of its culpable neglect in this direction; but before entering upon the detailed explanation of this particular system, it may be as well to set forth something of the different modes by which various inventors have sought to secure the desired end. For the purpose of a general explanation we may divide "electric clocks" into six kinds—

1. Those whose motive power is the electric current, acting upon what is usually the escapement, and impelling the hands. It has no pendulum. Shepherd's patent is a good example; one of them is the well known dial fixed on the right hand side of the gates of the Royal Observatory, on Greenwich Hill, and where as there, the circuit is very short, and a close personal attention is given, it is a very efficient electric clock.

2. Those whose motive is also the electric current, but in which it acts through a pendulum upon the escapement (exactly the reverse of an ordinary clock), and thence drives the hands. Mr. Richies, of Edinburgh, is the best specimen of this mode; several have been erected in the thoroughfares of that city, worked from the Observatory, and have acted well.

3. Those with an ordinary train, with a weight or mainspring as the source of power, but with the vibrations of the pendulum controlled by the current. This is the plan most generally adopted, and is the subject of several ingenious patents.

4. Those also with the ordinary motive power and train work, but regulated to a small gaining rate, the clock being automatically stopped at its own hour, minute, and second, but instantly liberated by the current at the corresponding true time. A clock of this kind forms the standard of time at Lombard Street Post Office, the clock being controlled from Greenwich, and reporting itself to the observatory after every "set" to enable its being checked there. A record of these "reports" are kept, and show some excellent results.

5. Clocks with the ordinary train and motive power, but in which the motion work (the wheels carrying and regulating the motions of the hands) is acted upon by an electro magnet, acting by driving a V piece into a notch on the periphery of a wheel. It is not by any means a satisfactory method and has never been largely adopted.

6. Clocks of the ordinary construction, in which the hands are set to Greenwich time by the direct action of the current acting upon them. Bain, whose decease has lately happened, first attempted this plan, in fact, he claimed (we think justly) to have been the originator of electric clocks; his method was, however, exceedingly crude, and was never adopted in practice.

The above may be roughly divided again thus—clocks *driven* by the electric current, clocks *controlled* by the electric current, and clocks *set to time* by it.

It seems to have been totally lost sight of that clocks have two distinct offices, what we may term an astronomical and a commercial one, and that the delicate and the absolute accuracy of the fraction of a second in the one, is in the other, valueless; no man in watching the rapidly passing minutes to catch a post, a railway train, or "pay in" at his bankers, questions how many seconds he has to spare, nor as he hurries along the street does he want the public clocks to show him seconds, but he does want (though longing generally in vain) that they shall not deceive him to any extent which can be appreciated by the minute hand, and any system which would secure such a result to our public or office clocks should be hailed with approbation. Such a system has just been patented by Messrs. Barraud and Lunds, of 41, Cornhill, and which has already received,

wherever shown, the unqualified approbation of electricians, horologists, bankers, and commercial men.

It is the invention of Mr. John Alexander Lund of that firm, whose utilization of electricity for horological purposes has been already noticed by us. He tells us that the "happy thought" was the conviction that success could only be reached in a direction totally differing from that where it had hitherto generally been sought, and he therefore asked himself the very simple question, what does any one do if their clock is wrong? why, the finger or thumb, or both, are simply applied to the clock hand itself, and it is "set to time;" why cannot I put a mechanical finger and thumb into the clock, close them electrically at the right moment, and so set the hand (whether fast or slow) to correct time? The application of the "happy thought" was merely a matter of mechanical arrangement, and in the hands of a practical mechanic as Mr. Lund is, the idea was soon developed into the fact; two levers carrying pins, and representing the human finger and thumb, project through a slot in the dial, and either close upon the end of the minute hand itself, or upon a small block fastened to it underneath; the two levers have at their other end slots in which two pins work, projecting from the keeper of an electro-magnet, which when magnetized at the given moment, by the closing of the contact springs on the standard clock, draws the pins together, and sets the hand to time. A reference to our plates will at once make the *modus operandi* clear. *e* is an ordinary electro-magnet, *g* the keeper, carrying a bar *h*, and two projecting pins *k k*; these act in slots *l l* in the levers *m m*, from the ends of which project the pins *o o* (representing the human finger and thumb) the passage of the current draws down the keeper and bar, acts upon the levers *m m*, closing them upon the minute hand of the clock and setting it, whether fast or slow, to time.

This is the simplest form of the invention as adapted to ordinary clocks and office dials up to 2½ or 3 feet, for larger or turret works suitable modifications are made. The first experiment (if experiment it could be called where so plain a result was expected) was made by coupling up the standard clock at Cornhill with a clock at the Shipmasters Association's new rooms in Jeffery's-square, the Post Office authorities very kindly and promptly erecting the wire at a day's notice, this clock has continued to show mean time ever since, and has been presented by Messrs. Barraud & Lunds to the Association. Another much larger one is being fixed in the principal room, in the window facing the square, which is now connected with the wire. It has been put up and will be maintained by Messrs. Barraud and Lunds, free of charge, for the benefit of the neighbourhood, who will thus possess the inestimable boon of certified correct time.

We may be sure that public institutions and important offices will not be slow to avail themselves of it; the Bankers Clearing-house was the first to do so, whilst the electric current will *en voyage* make a passing call at the principal banks, and secure their clocks being not only "right" with Greenwich, but with the Clearing-house. The Eastern Extension Telegraph Company to India have very liberally ordered a large dial to be erected over the doorway of their new offices, at No. 11, Broad-street, to be synchronized by the patent, so as to give this important locality a reliable standard of time; the Bank of England has ordered it to be connected with one of their clocks to form a standard for the rest. Other important institutions are in treaty, and we shall no doubt at last see the City of London kept in order as to true time.

The following are some of the special advantages claimed for this patent:—

1. That any number of clocks, few or many, of any varying sizes, can be synchronized to any agreed standard time-keeper.

2. That the mechanism is, when not in its momentary use, entirely detached from the works of the clock.

3. That it can be applied to existing clocks by simply being screwed in its place, and a narrow slit cut in the dial.

4. That any failure in the transmission of the time-current leaves the clock going in the ordinary way, to be "set to time" by the next completed current.

5. That the clocks are kept to time, whether *having otherwise* EITHER A GAINING OR LOSING RATE, even if such rate amounts to many minutes a day.

We have no space to do more than point out the peculiar utility of the patent in securing uniformity of time at railway stations and junctions, where by this simple process all the clocks say at Mugby junction, can be placed under the control of the chief signal box, and any accident from the present want of uniformity in time completely avoided.

Messrs. Lunds have wisely thrown the use of the patent open (under certain needful conditions), and watchmakers and others in our important provincial towns will do well to obtain an early concession so as to initiate its application to the local clocks.

FIG 1.

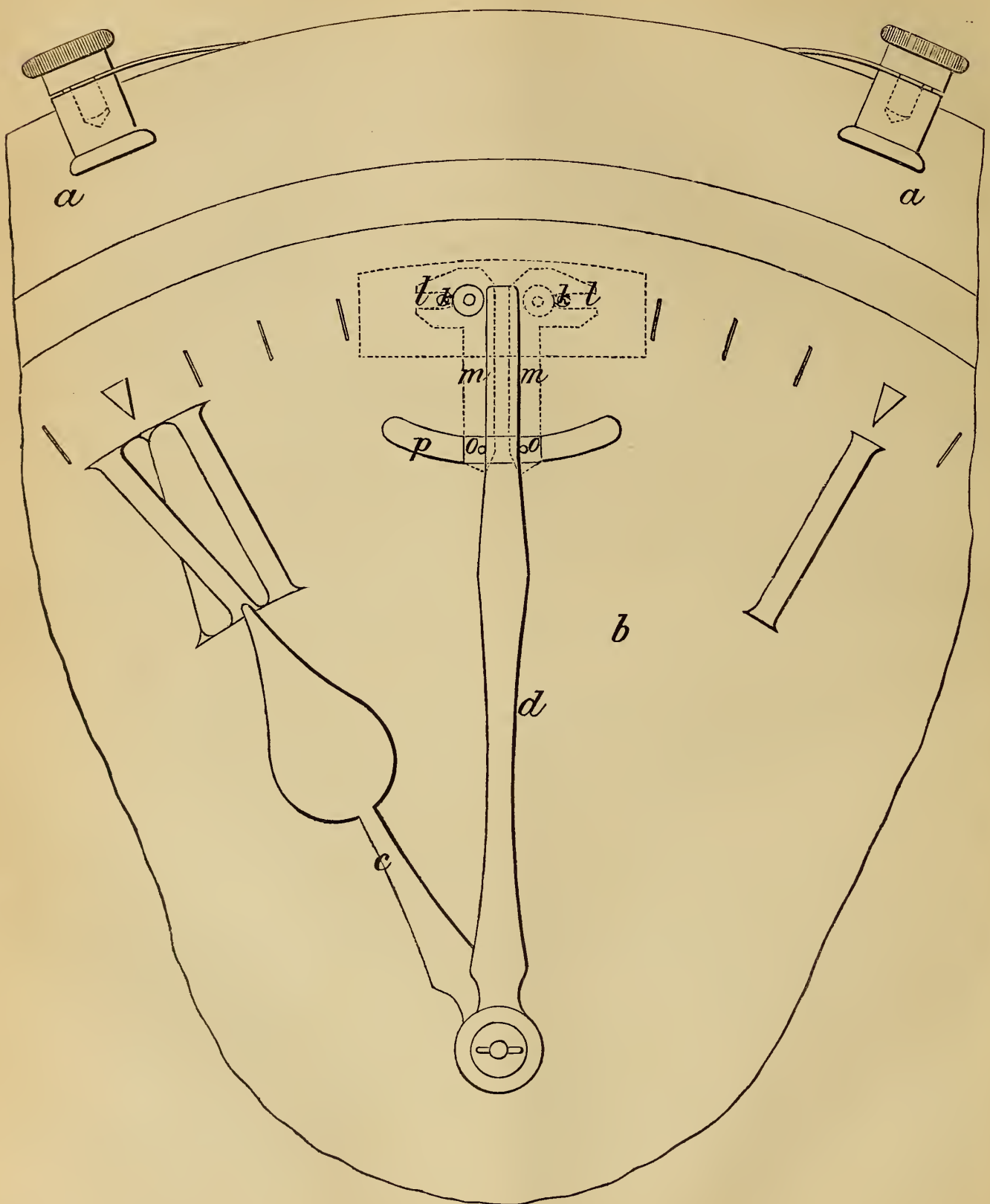


FIG 2.

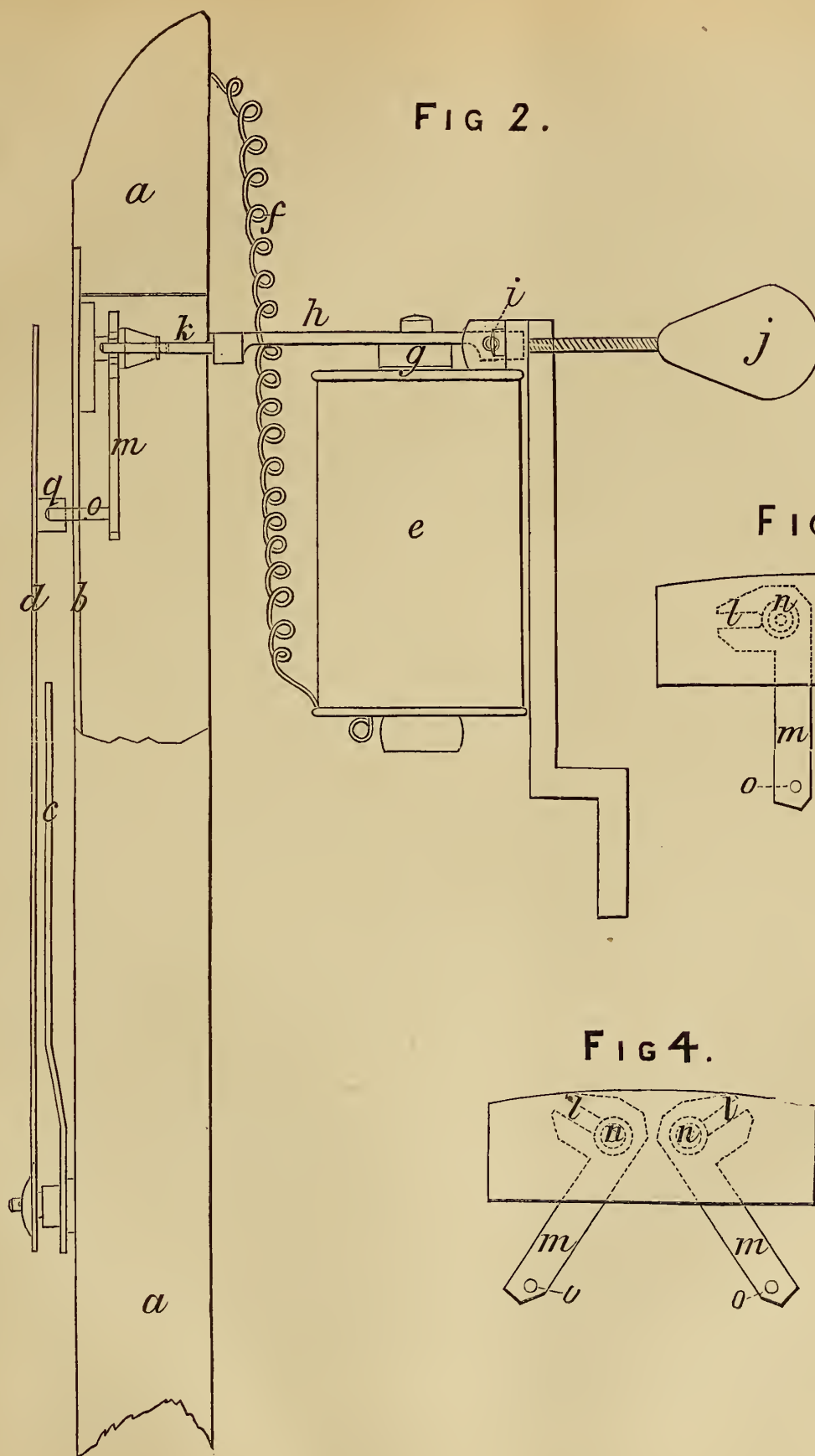


FIG 6.

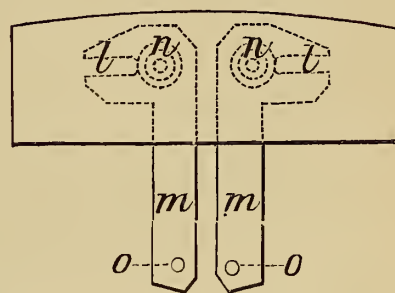
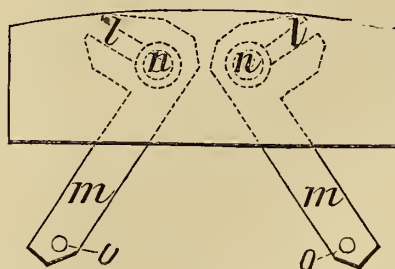


FIG 4.



GOLD.

(Continued from page 175).

IN the history of modern gold discoveries we find one remarkable fact, that the existence of this metal, in certain localities, has generally been long and well-known by private individuals, before the community at large could be prevailed upon to give it any recognition. Thus, the imputed date of a discovery is usually much later than the true date. We find this particularly with reference to Russia, Australia, and California. The rich gold workings in the Ural are commonly set down as of recent date, and yet Humboldt has pretty well proved that they were well-known to the ancients, and we find them evidently referred to by Herodotus; they are also mentioned in our own mining history, in a book published by Thomas Bushell, a great mining speculator in the reign of James I., and private secretary to Lord Chancellor Bacon. In this volume is an affidavit of Walter Busbee, assayer in the Mint, who, among other matter, incidentally states that he had been sent to Russia to give advice as to the gold mines beyond the Ural, and that being taken prisoner by the Tartars, he was kept in Siberia many years, but was eventually released and exchanged by the Grand Duke of Russia. These Ural workings have since proved very productive. The Australian gold field was (as shown in a previous number), pointed out by the late Sir Roderick Murchison, and well-known to many other scientific men and private individuals long before the public or the government would recognize its existence. As regards California, we find that as early as the reign of Queen Anne, a Captain Shelvocke, who had commanded a privateering expedition, published an account of his voyage, stating that the whole of the country abounded in gold, and that the black ferruginous sands of the rivers yielded it largely. Also, in 1815, an "Outline of Mineralogy and Geology," was published by William Phillips, in which we find the following passage—"On the coast of California there is a plain of 14 leagues in extent, about 14 inches beneath the surface of which large lumps of gold are irregularly interspersed." This fact was evidently the result of local observation, but yet the existence of gold was not publicly or generally acknowledged until the end of 1847, when the great Californian gold mania arose.

It would, therefore, at first sight, almost seem as if the public were prejudiced, or had a tendency to disbelieve in discoveries of this metal, but we find that this state of affairs is not peculiar to gold working as it extends to most social transactions, in fact, to everything that is *new*, or contrary to preconceived ideas. Most of us, both learned and unlearned, possess ourselves of certain opinions and notions, utterly refusing to believe in, or to heed, any truth unless it chances to coincide with those prepossessions, we are thus apt to form most unjust and incorrect judgments, at one time readily acquiescing in and accepting *anything* that conforms to our own preconceived views; at another, condemning and rejecting the most self-evident facts, simply because they fail to harmonize with our own prejudiced opinions. There is, indeed, no limit to either human credulity or unbelief. No two minds are exactly alike, neither from any given fact do they form the same deductions. We are all, more or less of us, *mad*, on some one point, which only remains accidentally undeveloped or discovered, and our opinions and minds are formed, not only by our different individual training, education, and general surroundings, but also by our *constitutional* tendencies—mind and matter invariably influencing each other. One scientific man, sane on all other points, but with metaphysical and imaginative tendencies, pins his faith on spiritualism, psychic force, and table-rapping; another, less romantic, more practical, and somewhat self-sufficient, perceiving a general similarity in the different developments of animal life and organization, immediately doubts the existence of a Creator, and promulgates his belief that the human race has originated in frogs or monkeys. A third, on an examination of the *same* facts, is overwhelmed with a sense of the "eternal fitness of things," and of the Divine Wisdom, each beautiful gradation of animal life, being viewed as a fresh proof of the Divine purpose, and harmony reigning throughout. Science has, therefore, in all ages, from Galileo downwards, met with both adherents and opponents, and not unnaturally; but as we each hold and cherish our own opinions, so ought we to respect and tolerate those of others. The most that we can individually know or acquire is as a mere nothing compared with what there is yet to learn. We are but as children gathering pebbles on the vast seashore of *infinity*, an eternity of wisdom remains beyond, of which we can but catch a transitory glimpse in the far distant horizon, but to *grasp* it is impossible. We, who with our small minds and petty views are yet unable to see or acknowledge our own duties or positions in life, are scarcely fitted to "grasp" the great plan of the Universe, which remains for a future age to accomplish. As volcanic

agency has been the divine means employed for displaying and giving to our use the treasures of the earth, which otherwise would have remained hidden for ever; so may we consider the present thirst for knowledge among the uneducated classes as but a vast *upheaval* of society, tending to one great end, the establishment and recognition of a perfect order and *harmony* throughout the whole. We may look forward to some future period, when mankind recognizing their perfect *equality*, and mutual obligations one to another will be united in one vast *brotherhood*, having one grand universal government and one code of laws, and in those days capital and labour will work hand in hand, poverty, with its accompaniments of vice and misery, will be unknown, wealth will be more evenly distributed, knowledge will flourish, wars will cease, and an eternal harmony and peace will prevail.

As a science, geology is only the creation of the last half century, but its history is full of *successive* and important discoveries. The blackband ironstone, the anthracite coal field of South Wales, the coal of Cannock Chase, the iron districts of Northamptonshire and Cleveland, &c., are all of *comparatively* recent discovery, and already minister usefully to the public service. So too in other manufactures dependent on minerals, there is much that is new. The soda manufacture has superseded that of kelp. The production of sulphur from pyrites has been effected on a large scale; in the iron manufacture new material, new fuel, new applications of blast, and new modes of making steel, have given it a vast extension, and so it is *throughout*. Geology has done much, but is at present only in its infancy. The study of it however, fully bears out Sir Roderick Murchison's statement that "*there are the same constants in nature*," and that "*there is a general agreement in all the gold bearing rocks*," enabling us, with a tolerable degree of certainty, to predict in what localities gold is likely to be found.

In our last number we expressed an opinion (based on these facts) that quartz mining might become as *permanent and steady* an industry as that of copper or coal mining, if it could be undertaken *profitably*. Few people have any idea of the large outlay of capital required in all mining transactions; or of the amount of patience that is necessary before any return can be expected; "pits" or "inclines" have to be driven, often to considerable depths (sometimes with no result), the roofs and sides being well "timbered" to prevent their giving way, and falling in; "shafts," or "air-ways," for ventilation must also be constructed; and in order to keep the "underground" safe, and free from water, expensive pumping engines must be erected;—to say nothing of other heavy expenses for the necessary plant, machinery, and working gear, the making of roads, railways, &c. All this involves much labour, and consequently a considerable expenditure in wages. Not only miners, but blacksmiths, bricklayers, masons, carpenters, engineers, and surveyors are required; and above all, there must be thoroughly practical, experienced, and trustworthy managers, (men beyond the reach of temptation,) whose character, knowledge, and responsibilities deserve and ought to command high salaries. The development of mineral wealth is therefore better undertaken by a well-constituted company than by a private capitalist, since (however good the undertaking might be) he would, unless possessed of very large resources, run the risk of ultimate ruin and failure, from the want of further capital to fall back upon in case of need, or his inability to wait until such time as the undertaking proved profitable. As an unsuccessful speculator, he would then meet with no pity or sympathy from his fellow men, but be at once condemned as an "adventurer," whereas he might be simply the victim of circumstances, deserving the greatest commiseration, and infinitely more worthy of respect than those who had been more fortunate. The good done by some speculators, such as Dr. Strousberg, in promoting and developing the trade and resources of a country, infinitely outweighs the evil, or losses caused by their failure. Who can do otherwise than pity the ruin of a man endowed with such an intellect, so much foresight, and with such extraordinary powers of organization? but "*success is necessary to success*;" the world is more or less addicted to the worship of the *golden calf*, and holds no crime so great as that of being *unfortunate*.

To be Continued.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY.—Fine Gold, 84s. per oz. Fine Silver, 4s. 10d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 10d. to 5s. (variable.)

MIRROR OF THE MONTH.

FEBRUARY.

FEBRUARY was one of the two months (January being the other) introduced into the Roman Calendar by Numa Pompilius, when he extended the year to twelve of these periods. Its name arose from the practice of religious expiation and purification, which took place among the Romans at the beginning of this month (*Februare*, to expiate, to purify). It has been on the whole rather an ill-used month, perhaps in consequence of its noted want (in the northern hemisphere) of what is pleasant and agreeable to the human senses. The name of Sol-monatt was afterwards conferred upon it, in consequence of the return of the luminary of day from the low course in the heavens which for some time he had been running. The common emblematical representation of February is a man in a sky-coloured dress, bearing in his hand the astronomical sign of Pisces. Gloomy, chilly, and rainy days are a prominent feature of the month, tending (as this year has unfortunately but too well shown) to a flooding of the country.

"February fill-dyke" was the name given by our forefathers, for when the snow melted, the rivers overflowed, the dykes brimmed over, and long leagues of land were under water. The average temperature of January, which is the lowest of the year is but slightly advanced in February; say from forty degrees to forty-one degrees Fahrenheit. Nevertheless, while frosts often take place during the month, February is certainly more characterized by rain than by snow, and our unpleasant sensations during its progress do not so much arise from a strictly low temperature, as from the harsh damp feeling which its airs impart. The tendency of the month to wet, and its uncertain temperature, as hovering between winter and spring, have been often expressed proverbially. In Scotch recollections we find

"A' the months o' the year
Curse a fair Februeer."

According to Asserius, the great historian, the early dawn of Horology appeared in the "Fill-dyke" or February month of the first year of Alfred the Great's reign; for Alfred caused six tapers to be made for his daily use, each taper containing twelve penny-weights of wax, was twelve inches long, and of proportionate breadth. The whole length was divided into twelve parts, or inches, of which three would burn for one hour, so that each taper would be consumed in four hours; and the six tapers being lighted one after the other, lasted for twenty-four hours. But the wind blowing through the windows and doors, and chinks of the walls of the chapel, or through the cloth of his tent, in which they were burning, wasted these tapers, and, consequently, they burnt with no regularity; he therefore designed a lantern made of ox or cow horn, cut into thin plates, in which he enclosed the tapers; and thus protecting them from the wind, the period of their burning became a matter of certainty. Although this is an amusing and oft quoted story, and like many others, lacks authenticity, still there is nothing very questionable in such mode of measuring time.

Jewellery also has an interest in February, for Asser, the friend and biographer of Alfred, tells us that it was in this month that the "Alfred jewel" was finished. With regard to that subject, we learn that among the innumerable artificers collected together from all parts by this king, there were not a few workers in gold and silver, who, acting under his immediate instructions, executed, with incomparable skill, many articles of these metals. From the circumstance of the jewel having inscribed on it in Saxon characters *Aelfred me haet gewercan* (Alfred had me wrought), we may reasonably conclude that it was made under his own superintendence, and further, from its richness of workmanship and material, that it was a personal ornament worn by the good king himself. The lower end of the jewel is formed into the head of a griffin, a national emblem of the Saxons. From the head of this figure issues a small tube, crossed in the interior by a minute pin of gold. The latter is evidently intended to connect the ornament with the collar or band by which it was suspended round the neck; the general flatness of form indicating that it was worn in that manner. Antiquaries have not agreed as to the person represented on one side of the jewel. Some have supposed it to be the Saviour, others St. Cuthbert, or Pope Martin. But the opinion that it represented Alfred himself, symbolizing his kingly office, is as general and tenable as any yet advanced upon the subject.

Astronomy also claims a place in the month, for on the 18th of February, 1564, Galileo was born. He discovered the isochronism of the vibrations of the pendulum, invented the thermometer, constructed the first telescope, and discovered the satellites of Jupiter, and the spots on the sun.

PRACTICAL INFORMATION FOR THE TRADE.

GENEVA CYLINDERS.—The length of a cylinder, can be obtained by the following method:—Take off jewel covers, screw on the cock, and take the distance outside the jewel holes with a pair of pinion gauges—this is the length, pivots and all. The diameter is obtained from the scape-wheel thus:—If the foot of the cylinder is held between two teeth and against the point of one, the heel of the next must be quite free of the cylinder. With a depthing tool, the watchmaker can put the scape-wheel and cylinder into it, and see if the cylinder has the same freedom inside and outside, that is, the tooth should have equal "drop" into the inside, and to the outside of the cylinder; but the point of the tooth should not drop too far into the cylinder, just enough to be safe is all that is required. There are three dots, one on the plate close to the edge of the balance, and another on the rim of the balance, to mark the place for the hair-spring stud, and when the balance is at rest the dot on it is close to the middle one on the plate. In new watches these dots mark the extent of the balance of impulse, that is, a tooth escapes when the dot on the balance reaches the outside dots on the plate. Before the balance is riveted too tight, the cylinder should be put in and tried; and the balance turned round on the cylinder until the teeth escape at the dots; you will thus get the banking, and also the escapement right at once.

TO BRIGHTEN IRON.—The following method of brightening iron, which appears suitable for some of the less important parts of large clocks, is recommended by Boden. The articles to be brightened are, when taken from the forge or the rolls, in the case of such articles as plate, wire, &c., placed in dilute sulphuric acid (1 to 20), where they remain for about an hour. This has the effect of cleansing them, and they are washed clean with water and dried with sawdust. They are then dipped for about a second in commercial nitrous acid, washed carefully, dried in sawdust, and rubbed clean. It is said that iron goods thus treated acquire, without undergoing any of the usual polishing operation, a bright surface having a white glance. Care should be taken by any one using the nitrous acid not to inhale its fumes.

ANILINE BRONZING FLUID.—Take 10 parts of aniline red (fuchsine) and 5 of aniline purple, and dissolve in 100 parts of alcohol of 95°, taking care to help the solution by placing the vessel in a sand or water bath. As soon as the solution is effected, 5 parts of benzoic acid are added, and the whole is boiled from five to ten minutes, until the greenish colour of the mixture is transformed into a fine light-coloured bronze. This bronze is stated to be very brilliant, and to be applicable to all metals, as well as to other substances. It is easily laid on with a brush and dries quickly.

JEWELLERS' ALLOY.—The following alloy was, not long since, patented in France:—Copper, 720 parts; nickel, 125 parts; bismuth, 10 parts; zinc, 90 parts: soft iron, 20 parts; tin, 20 parts. This is said to form a fusible, malleable metal, easily worked by a silversmith; it resists the oxidizing action of the air, and is capable of being soldered.

BOOK NOTICE.

"*The Practical Gold-worker, or the Goldsmiths' and Jewellers' Instructor.*" By GEORGE E. GEED. London: Crosby, Lockwood & Co., 7, Stationers' Hall Court, Ludgate Hill, 1877.

THE trade will find this work a thoroughly practical treatise on the different uses and applications of gold, &c. As a guide to workmen and apprentices it must prove of great value. The author states in his preface, that "the main object of the volume is to benefit that class of practical goldworkers who take an interest in the daily business of their life, to which, perhaps chance or choice has called them, but who may unfortunately be unable to improve their position, from the want of a higher, and more comprehensive knowledge of their calling. He has, therefore, tried to make the matter plain and intelligible to all who may give it their attention." We find instructions in the art of alloying, melting, reducing, colouring, refining, manufacturing, &c. Also a variety of useful rules and recipes which will be found of much service. In fact, there is such a valuable amount of information contained in so very small a compass, that we have no doubt this work will meet with the general appreciation it unquestionably so well deserves.

A NEW Pocket Photometer has lately been described to the French Society of Photography by M. Schutte. The instrument has exteriorly the form of a small telescope.

WATCHMAKING IN THE UNITED STATES.

WE quote the following address delivered in the Amphitheatre of the Primary College of La Chaux-de-Fonds on Tuesday, the 14th of November, by M. Edouard Favre-Perret, Member of the International Jury on Watches of the Exhibition at Philadelphia, and one of the Swiss Commissioners to the United States.

On opening the meeting, Mr. Arnold Grosjean, President of the Board of Commerce, announced that M. Edouard Favre-Perret, member of the International Jury on Watches at the Exhibition at Philadelphia, had kindly consented to repeat at La Chaux-de-Fonds, the speech already delivered by him at Locle and Neuchâtel, on the situation of the industry of watchmaking in the United States.

The Board of Commerce would have liked to be able to present the public some specimens of American watchmaking, but this was not possible. In a few days from now a selection of twelve American watches will be placed in the Horological School, where everybody may examine them.

Mr. Grosjean then added, that after the lecture the orator would kindly answer any question that might be put to him.

THE ADDRESS.

"GENTLEMEN,—I must, to start with, announce to you that you have not an orator before you, but a manufacturer, and as such, I ask your indulgence. I shall give you information, which unluckily is not cheerful, on the condition of Swiss watchmaking compared with the American competition. I shall tell you of facts simply, such as I have seen them, such as I have understood them. Frankness is here more necessary than anything else, for it is not by palliating the bad sides of a difficult situation that we can succeed in improving it.

"It is evident, gentlemen, that I do not present you with an entire report of my observations at the Exhibition at Philadelphia. These will find space in my Report which I shall address to the Federal Council. I shall confine myself to speaking about American watchmaking, and in comparing it with our own and that of our neighbours. I shall speak to you more about figures than about anything else. Figures, you know, have their own eloquence. For a long time we have heard here of an American competition, without believing it. The sceptics—and there were many of them—denied the possibility of a competition at once so rapid and so important. To-day we are forced to believe the proofs of it, and to acknowledge the existence of a formidable manufacture. We have had the proofs of it under our own eyes; we have seen the American factories, and we have been able to satisfy ourselves exactly as to their power.

"We have treated the American manufacture as we have treated the neighbouring manufactures, in the future of which we did not wish to believe at first, and which form to-day a most serious competition. I refer to Besançon, Bienne, St. Imier, Morat, Schaffhausen. We must take these examples into consideration, and spare no efforts to keep and maintain ourselves on the level of our competitors, and we must not allow ourselves to be overtaken by them, as has been the case in past years. Before passing to the watchmaking of the United States, let us examine some of the figures of the manufacture of Besançon, which everybody knows dates back to the end of the last century. It was founded by a colony of Neuchâtelois.

"In 1845 Besançon turned out ..	54,000 watches.
"In 1855	192,000 "
"In 1865	296,000 "
"In 1875	420,000 "

"To-day Besançon supplies the great market of France, and she prepares to contest with us the other European markets.

"Well, gentlemen, we are on the same road as regards the United States. For a long time America has been the principal market for our watches—our milch cow, so to speak. To-day we must earnestly prepare to struggle with the Americans on the fields where hitherto we have been the masters. Some of you have known Mr. Dennison, who was, we may say, the father of American watchmaking. Mr. Dennison travelled through the canton of Neuchâtel, studying our mode of manufacturing, seeking to inform himself of everything, and carefully noting the weak parts in our industry. After his return to the United States he founded a factory at Boston, 'The Boston Watch Company.' This was in 1854. The capital—scarcely 100,000 dollars—was subscribed by capitalists more than by practical business men. In the beginning, the company turned

out only the rough skeleton movement and attended to the finishing; all other parts, such as trains, balances, jewels, &c., were imported from Switzerland. Little by little, however, the factory extended its operations and produced other parts. Notwithstanding all this progress, this mode of doing things not suiting the American character, so little inclined to let capital remain almost unproductive, the capitalists abandoned the factory, and it failed in 1856.

"Another American, Mr. Robbins, whom you have also known, gentlemen, when he had business relations with us, scented a good speculation, and bought in the entire factory, tools included, for 75,000 dollars. Then a year after he incorporated it at 145,000 dollars in a new company, 'The American Watch Company,' with a capital of 200,000 dollars. Soon this capital became insufficient, and it was increased to 300,000 dollars before the War of Secession. This war, which seemed calculated to destroy such an enterprise, was, on the contrary, the cause of its prosperity. America put on foot a million of soldiers, and as every one wanted his watch, there was great animation in the watch business. At this juncture, which might have been a lucky one for our industry, we failed to comprehend our real interests. Instead of sending good watches to the Americans, the worst trash was sent. Had mere skeleton movements been sent in cases, they would have been thought good enough. The Americans, however, went to work on an entirely different plan. The company increased their plant, and turned out a better ordinary watch than the Swiss watch. At the end of several years, and with the aid of patriotism, the American watch enjoyed a good reputation while our own was discredited everywhere.

"The capital was increased to 750,000 dollars, and the operations of the new company grew to immense proportions. During the following years business went on so well that everywhere new watch factories sprung up. Every one wanted to make watches. To-day you can count about eleven factories. . . . The Waltham Company give employment to 900 workmen, and make about 425 movements per day. The company again increased their capital in 1872; it amounts to-day to 1,500,000 dollars, besides 300,000 dollars as reserve fund, or a capital of 9,000,000 francs. This watch factory is a real power; there is none like it in Europe. We have seen it in all its details, and we have admired its splendid organization. . . . Their tools work so regularly that all parts of the watch may be interchanged by a simple order on a postal card, without necessitating the forwarding of the adjoining piece. The question has often been asked whether the Americans can sufficiently supply the demands of their markets. Yes, they can; we are driven out of the American market, I herein exclude, however, elaborate watches, in which we are now, and I hope we shall always remain masters.

"In 1860 the American companies produced only 15,000 watches; in 1863, 100,000. To-day they produce 250,000, and this figure can be easily doubled in case the crisis, which so severely prevails there as well as here, should come to an end. For we must not forget that, if several factories have been closed during the crisis, the tools, as well as the workmen, are still there, all ready to resume work again. Nor must we leave out of sight the exorbitant customs duties and freight, which amount to about 25 or 30 per cent., which take away from us every possibility of being able to stand the fight. And now that we know the figures of production in the United States, we can easily, with the aid of official reports, give an account of what is that country's consumption of watches. We have sent to the United States:—

"In 1864	169,000 watches.
"In 1865	226,000 "
"In 1866	262,000 "
"In 1867	207,000 "
"In 1868	209,000 "
"In 1869	206,000 "
"In 1870	330,000 "
"In 1871	342,000 "
"In 1872	366,000 "
"In 1873	204,000 "
"In 1874	187,000 "
"In 1875	134,000 "

"In 1876, we shall barely send there 75,000 watches, or, since 1872, a deficit of 300,000 watches. What a loss for Switzerland, and particularly for Neuchâtel! For this deficit concerns principally our Canton, and it is very easy to convince oneself of the fact. In 1875, Chaux-de-Fonds turned out 106,000 watches or movements. In preceding years she turned out double that amount. The deficit, therefore, amounts, for la Chaux-de-Fonds alone, to 4,000,000 francs, for Locle, Neuchâtel, &c., it reaches the same figure in proportion.

"We have stated that the shipment of our goods has largely decreased. Shall we attribute its cause to the crisis? Certainly in many respects we may do so, it cannot be denied. But the American competition contributes still more largely to it.

"The Americans have already commenced to send their manufacture to Europe. In England they sell annually from 20,000 to 30,000 watches. The American watch commences to drive from the English market the Swiss, and even the English watch. The Americans commenced by creating a demand for their goods in the Indies, and in Australia; and then, thanks to some powerful exporting houses, they invaded England. At Moscow and St. Petersburg they have already established important branch offices. They do not keep it secret, but loudly advertise it; their aim is to drive us first out of their own country, and then to compete with us on our own soil, if our sluggishness and our blind confidence leave the field free to them. I sincerely confess that I personally have doubted that competition. But now I have seen—I have felt it—and am terrified by the danger to which our industry is exposed. Besides, I am not the only one to think so; the 'Société Interantonale' have sent a delegate to make inquiries, and his report perfectly agrees with mine. Up to this very day we have believed America to be dependent upon Europe. We have been mistaken. The Americans will send us their products since we cannot send them our own. Their importation is not confined to watches alone. Other European trades are threatened like ours. Already America has commenced to send cotton goods to England, which hitherto monopolised that article in all the markets of the world.

"In 1840 the American Government compiled the statistics of the products of their manufactures. They amounted to 198,000,000 dollars; in 1850 to one milliard; in 1860 to 1,885,000,000 dollars; and in 1870 to 4,200,000,000 dollars. Not all of these products are being sold in the interior of the United States; a good share of them are exported. Nevertheless, from June 30, 1874, to June 30, 1875, the imports were larger than the exports. We ask ourselves whether the Americans can maintain their prices? I answer, yes, they can, for if they obtain a good profit on their superior quality goods, they can afford to be satisfied with a smaller profit on the lower grades of watches. In America everything is made by machinery; here we make everything by hand. We count in Switzerland about 40,000 workmen making on an average each per annum forty watches. In the United States the average is 150 watches. Therefore the machine produces three and a half to four times more than the workman. It remains for us to solve the situation. But how can we get out of the corner into which we have been driven? To-day, even without machines, we cannot dispose of the 1,600,000 watches which our people can manufacture. How will it be if we establish machines which will thrice increase our production? We must either diminish the number of our hands and make machines, or else cling to our system and be resigned to see our industry decline.

"Gentlemen, I do not pretend to point out the remedy. I simply call your attention to the evil—that is all. It remains for you to find the cure. However, I believe that it will be good to do for our mechanicians what we have done for our watchmakers, that is, to create schools. You must not despair; you must not desert the field; you must, on the contrary, organize for resistance, and to reconquer the lost ground. If America closes her gates to us by customs duties, and exorbitant expenses, we are at least left the resource of energetically fighting against her in European markets."

[Here the orator gave an extract from the report of M. Hirsch (Director of the Observatory), to the Council of State, after the Exhibition of 1867. This report already signalled the danger confronting our industry. Resuming, he said:]

"Had the Philadelphia Exhibition taken place five years later, we should have been totally annihilated without knowing whence or how we received the terrible blow. We have believed ourselves masters of the situation, when we really have been on a volcano. And to-day we must actually struggle if we do not want to encounter in all the markets that rival manufacture. Did we not sneer at Besançon at the outset? And now Besançon suffices for France, and besides, she exports her surplus of manufacture. We ask ourselves if, in reducing the prices of watches, we can increase their sale in the same proportion? And if the sales do not increase, what will become of us? We shall have an enormous stock of goods and a permanent stagnation. The customs duties, you know, amount to about 25 per cent. For a long time hopes have been entertained that they might be reduced. We cannot count on it. America needs all her resources, especially in her present situation; and whether Democrats or Republicans be in power, we cannot hope for a reduction in import duties. We must therefore make up our minds to lose the American market!

"It has been said, and it has been complacently repeated, that the Americans do not make the entire watch, and that they are dependent upon Switzerland for several parts of the watch. This is a mistake. The Waltham Company make the entire watch—from the first screw to the case and dial. It would even be difficult for them to use our productions so great is the regularity, so minute the precision with which their machines work. They arrive at the regulation of the watch—so to say—without having seen it. When the watch is given to the adjuster, the foreman delivers to him the corresponding hair-spring, and the watch is regulated. (Sensation among the audience.) Here is what I have seen, gentlemen. I asked from the director of the Waltham Company a watch of the fifth grade. A large safe was opened before me; at random, I took a watch out of it and fastened it to my chain. The director having asked me to let him have the watch for two or three days, so as to observe its motion, I answered, 'On the contrary, I persist in wearing it just as it is, to obtain an exact idea of your manufacture.'

"At Paris I set my watch by a regulator on the Boulevard, and on the sixth day I observed that it varied 32 seconds. And this watch is of the fifth American grade; it cost 75 francs (movement without case). At my arrival at Locle I showed the watch to one of our first adjusters, who asked permission to 'take it down'—in other words, to take it to pieces. I, however, wished first to observe it; and here is the result which I noted:—Hanging, daily variation 1½ seconds; variation in different positions, from 4 to 8 seconds; in the 'heated room' the variation was but slight. Having thus observed it, I handed the watch to the adjuster, who took it down. After the lapse of a few days he came to me and said, word for word, 'I am completely overwhelmed; the result is incredible; one would not find one such a watch among 50,000 of our manufactures.'

"This watch, gentlemen, I repeat to you, I took at hazard—out of a heap as we say. You understand from this example that the American watch may be preferred to the Swiss. I have finished, gentlemen, and I have told you of things such as I have seen them. It remains for us to profit from this sad experience and to improve our manufacture. Competent men are not wanting among us; they must go to work at once."

A round of applause followed the speaker as he descended the tribune.

PHILADELPHIA AWARD FOR ENGLISH SAFES.

THE highest award for fire and burglar proof safes at the Centennial was granted to Samuel Chatwood. Among the display of safes at that Exhibition was a large assortment of Chatwood's general safes, and one specially manufactured for bankers, as well as another for diamond merchants. The former containing two smaller safes for bills, notes, or valuable documents, and the latter being two inches thick on all sides, fitted with his patent tee frame, solid flange lock, curvilinear edge door, "dovetail claw bolts," and "multiple combination lock," these being the only safes in the world sold subject to a trial of thirty-six hours with any kind of burglar appliances, before delivery. In addition to the above, the identical challenge safe, which, at the Paris Exhibition was pitted against the world, there alluded to by a leading Scientific Journal as the "foremost safe of the day," was also sent by Mr. Chatwood to the Centennial.

Mr. Chatwood has just designed and constructed for a Provincial Bank the largest steel safe yet made, it being 24 feet long, 12 feet wide, and 11 feet high, fitted with two of his patent "intersected steel" doors, each two inches thick. In the middle of the safe, which stands beneath the centre of the banking-room, is an elevator, about 8 feet wide, 7 feet high, and 2 feet from front to back, with compartments in front for tellers, and at back for the clerks. The elevator, which in the day-time stands in the banking-room as an ordinary fixture, is placed on a hydraulic ram; the cover of the elevator is of the same quality as the doors of the safe itself, i.e., two inches thick, its curvilinear edge forming a cornice, with the lock case for its plinth, and large round bolts of phosphor bronze with their ornamental ends for the ornaments on the plinth, to correspond with the ornaments on the furniture of the banking-room. After the business of the day is over, the elevator descends into the safe below, its top forming a horizontal door of the same strength as the vertical doors below by which the safe is entered. This safe contains all Chatwood's inventions for protecting valuable property from the depredations of scientific burglars, some of which for obvious reasons cannot prudently be described in a public print, but which may, we have no doubt, be inspected by bankers or others on Mr. Chatwood's introduction. Large as this safe is, it will nevertheless be outstripped by one recently designed by Mr. Chatwood, and which is now in course of construction, for the head office of one of the oldest and largest banks in the United Kingdom.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 125.)

ACCORDING to "Kent's Directory" there were in London, in 1781, sixty-seven watch and clock makers, who were as follows:—

Addis, William, 3, Birch Lane.
 Atkins Francis, 35, Clements Lane.
 Atkins, Robert, 20, Salisbury Street, Strand.
 Baird, John, 190, Strand.
 Barton, John, 64, Red Lion Street, Clerkenwell.
 Berridge, William, Clock & Watchmaker, 69, Oxford Road.
 Bidlake, James, Clock & Watchmaker, 31, Minories.
 Bingham, Thomas, Watch Chainmaker, 3, Middle Row, Holborn.
 Blundy, Joseph, Clock & Watchmaker, 21, St. John Street, Clerkenwell.
 Brockbank, John, Clock & Watchmaker, 6, Cowper's Court, Cornhill.
 Byrant & Son, Clock & Watchmakers, 47, Threadneedle Street.
 Cabrier & Leekey, 15, Basinghall Street.
 Carrington, Richard, 22, Old Bethlem.
 Charlier, Isaac, 1, Angel Court, Throgmorton Street.
 Chater, Eliezer, 10, Exchange Alley, Cornhill.
 Chater, James, 3, Cherry Tree Court, Aldersgate Street, and 14, Cornhill.
 Conden, Robert, 51, Clerkenwell Close.
 De St. Leu, Daniel, Watchmaker to Her Majesty, 17, Cloak Laue, College Hill.
 Devis, John, 76, Lamb Conduit Street.
 Ellicot, John & Son, 17, Sweeting's Alley, Cornhill.
 Evans, James, 7, Sweeting's Alley.
 Farran, Robert, Watch Chainmaker, 9, Middle Moorfields.
 Fitter, Thomason, 37, St. John's Square, Clerkenwell.
 Fladgall, John, Conduit Street, Hanover Square.
 Fleetwood, Robert, 33, Abchurch Lane.
 Fox, Isaac, 39, Minories.
 Gout, Ralph, 6, Norman Street, Old Street.
 Gray, Adam, 5, Berkeley Street, Clerkenwell.
 Green, James, 5, Fenchurch Street.
 Hardy, John, 8, Bridgewater Square, Barbican.
 Hitchin, Joseph, 4, Brown's Buildings, St. Mary Axe.
 Holmes, John, near Somerset House, Strand.
 Howard, Edward, 6, Great Kirby Street, Hatton Garden.
 Hunter, Thomas, junr., 156, Fenchurch Street.
 Jackson, John & Co., 2, Bridgewater Square, Barbican.
 Jessop, Josias, 38, Southampton Street, Covent Garden.
 Lamb & Webb, 21, St. John's Square, Clerkenwell.
 McCabe, James, 11, Bell's Building, Fleet Street.
 MacLennan, Kenneth, May's Buildings, St. Martin's Lane.
 Martin Thomas, 27, Cornhill.
 Martineau, Joseph, St. Martin's Court, Leicester Square.
 Mason, William, Dockhead, Southwark.
 Mitchelson, Walter, 3 Helmet Row, St. Luke's.
 Norton, Eardley, 49, St. John Street, Clerkenwell.
 Peacock, George, 4, Sweeting's Alley, Cornhill.
 Philp, Musical Clockmaker, 6, New Court, St. John's Street, Clerkenwell.
 Prigg & Ansell, Clock and Watch Spring Makers, and Steel Manufacturers, Middle Moorfields.
 Prior, George, 3, Prescott Street, Goodman's Fields.
 Rigby, Joshua, 5, Berkeley Street, Clerkenwell.
 Rimbault, Paul, Clockmaker, 9, Denmark Street, St. Giles.
 Rogers, Isaac, 44, White Hart Court, Gracechurch Street.
 Rose, Joseph & Son, 17, Foster Lane.
 Sanderson, Henry, 301, Strand.
 Scott, John, 40, Gloucester Street, Red Lion Square.
 Sidey, Benjamin, 5, Moorfields.
 Spencer & Perkins, 44, Snow Hill.
 Stuck, William, Cockspur Street.
 Strigel, George Philip, Stafford Row, near Buckingham Gate.
 Thompson, John, 10, Red Lion Street, Clerkenwell.
 Tulet, Edward, 10, Fenchurch Street.
 Twyford, Robert, 40, Strand.
 Underwood, Robert, 3, Falcon Street, Aldersgate Street.
 Upjohn, James & Co., 12, Red Lion Street, Clerkenwell.
 Vale, William, 12, Bunhill Row.
 Webster & Son, 11, Change Alley.
 Wieksteed, 114, Bunhill Row.
 Willshire, James, 19, High Holborn.
 One of them, Ralph Gout, was the patentee of a watch in which time and measure were united.

In the South Kensington Museum are a gold watch and pedometer combined, in an enamelled and chased case, the diameter of the watch is $2\frac{1}{4}$ inches, and the length of the case is 85. This instrument is by Ralph Gout, and it was purchased for 20*l.* 10*s.*

In 1788 was published an etching in folio, by T. Nixon, of James Davis, a lunatic at Margate, who died in 1790. He is represented whole length, with a leek in his hat. He was brought up as a watchmaker, and afterwards became sexton of St. Bride's, London.

In March 1788, a gold watch was found upon an open common in the neighbourhood of Leeds. It had been lost by a gentleman when fox-hunting about sixteen years before.

During the war of 1796, a sailor went to a Mr. MacLareu, a watchmaker, and presenting a small French watch to him, demanded to know how much the repair of it would come to. Mr. MacLaren, after examining it, said, "It will be more expensive repairing than its original cost." "I don't mind that," said the sailor; "I will even give you double the original cost, for I have a veneration for the watch." "What might you have given for it?" said the watchmaker, "I gave a fellow a blow on the head for it, and if you repair it I will give you two."

Early in the present century was to be seen in the stables of the Elector of Saxony a watch fitted in the pommel of his saddle.

At the commencement of the same century a watch was cleaned on the summit of Salisbury spire. From time to time, some daring person has climbed this spire to oil the weather-cock, a most dangerous feat, as the top of the spire is 404 feet from the ground. It is ascended by ladders for about three-fourths of its height, which are fixed inside the spire. A small door then opens, and the adventurer has to climb the rest of the way by a series of irons, something like the handles of flat irons, which are fixed in the stonework, and by which he is able to make his way to the top to complete his dizzy work. On one occasion some persons were assembled at the "Pheasant," in Salisbury, and were talking about this feat, when a watchmaker, named Arnold, who was present, offered for a small wager to ascend the spire; to take with him his tools and a watch; to take the watch to pieces on the very top of the spire; to clean it properly; and to bring it down in less than an hour. He accordingly climbed the spire, fixed his back against the stem of the weather-cock, completed his task, and descended within the given time.

In the season of 1806-7 the admirers of the performance of Joe Grimaldi, the clown, at Sadler's Wells Theatre, presented him with a handsome watch, the face of which was so contrived as to represent a portrait of himself in the act of singing his romantic ditty of "Me and my Neddy." In 1809 two highwaymen who knew Grimaldi robbed him of his watch and other articles on Highgate Hill. One of the thieves, however, induced his companion to restore the watch, which they valued at only two pounds, to its owner on the spot.

The gold watch of Patrick Cotter, *alias* O'Brien, the Irish giant, who was born in 1761, and died about 1808, is still in use, and keeps time as well as ever. It is of unusual size, its works are of extraordinary strength, and it weighs a pound with the chain and seals. It is a chronometer and repeater, and was made large and suitable for its huge owner. It has his name engraved on the cap—"Patrick Cotter, Kinsale, Ireland." It was purchased by the father of the present possessor at a sale after the giant's death.

In the *Gentleman's Magazine* for 1809 are the following lines:—"On seeing a French watch round the neck of a beautiful young woman:—"

"Mark what we gain from foreign lands,
 Time cannot now be said to linger,
 Allowed to lay his two rude hands,
 Where others dare not lay a finger!"

These identical lines also appear in the same Magazine for 1811, probably being reproduced by mistake. In neither instance does the author's name appear, but in *Arlis's Pocket Magazine* for 1818 we find them figuring under the initials of "A. R." as an epigram on seeing a French watch suspended upon the breast of a young lady. A. R. does not, however, acknowledge his indebtedness to the *Gentleman's Magazine*.

A writer in 1809 tells us that shortly after Easter in every year the baptism of St. Vincent Terrier was portrayed in the church of St. Stephen at Valencia, by twenty statues or puppets as large as life, representing the priests, clerk, godmother, midwife, servants, and others. An amusing anachronism was displayed in this religious exhibition, for the woman figures were fully dressed in the ten French styles, with watch chains among other personal decorations. St. Vincent was born in 1357, and died in 1419, dates long antecedent to the time of the invention of watches.

To be continued.

HISTORY OF ASTRONOMY.

(Continued from page 102).

MANY distinguished astronomers flourished at the time with Copernicus, or soon after. Of these Schöner, Nonius, Apian, Friscus, Rothman, Byrgius, and William IV., Landgrave of Hesse Cassel, Rheticus, &c., enriched the science with many valuable improvements, the result of diligent study and observation.

One eminent personage, who considered the opinions of Copernicus as at variance with the doctrines of the Bible, and yet was aware that Ptolemaic system would not satisfactorily account for many of the motions and appearances of the heavenly bodies, endeavoured to invent a system which should harmonize with the Scriptures and at the same time remove the difficulties.

This was Tycho Brahe, a Danish nobleman, who resided at Uraniburg, in the Isle of Huen, near Zealand. He accordingly asserted that the earth was fixed in the centre, and that the moon and sun revolved round her; that the planets Mercury, Venus, Mars, Jupiter, and Saturn, moved round the sun, and together with him were carried round the earth. This system was too absurd to gain much footing with the learned; but, though he was unsuccessful in planning a new system, he rendered great services to the science in general by forming a catalogue of the stars with greater exactness than his predecessors, and determining the effect of refractions, whereby we see the sun or a star above the horizon when it is not so in reality. He discovered two of the principal irregularities in the moon's motion, the variation, not the annual equation; and demonstrated that comets and meteors are but solid bodies, like the planets, and, like them, revolve about the sun. In such estimation was this eminent astronomer, held that learned men repaired to him for advice, and even monarchs condescended to visit him in his retirement. After the death of the King of Denmark he, at the invitation of the Emperor Rodolphus, went to reside in a castle near Prague, which that monarch gave him, but he lived not long to enjoy his new situation. He died October 14, 1601.

Cotemporary, and a coadjutor with Tycho during his residence in Bohemia, was John Kepler, whose name is celebrated as the discoverer of certain laws that regulated the planetary motions, though he did not demonstrate those laws, yet he gave such information as laid the foundation for the immortal Sir Isaac Newton to demonstrate an absolute necessity of those laws; and that without a total subversion of the "laws of nature" the heavenly bodies cannot be otherwise regulated. Hence the first founder of modern astronomy was Kepler; and if it be the privilege of genius to change received ideas, and to announce truths which had never before been discovered, he may justly be considered as one of the greatest men that had yet appeared in the world.

Hipparchus, Ptolemy, Tycho Brahe, and even Copernicus himself, were indebted for a great part of their knowledge to the Egyptians, Chaldeans, and Indians, who were their masters in the science; but Kepler, by his own talents and industry, has made discoveries of which no traces are to be found in all the annals of antiquity. This great philosopher was born at Wül, in the province of Wurtemberg, in Germany, in 1571, and was one of the most zealous partisans for the Copernican system that had hitherto appeared.

Baron Napier, the celebrated inventor of the Logarithms, was no mean proficient in astronomy.

But it was now destined to receive a powerful assistance, by means of which wonders have been discovered, that, without it, would have been for ever hidden from mortal eye. The telescope had been invented and used for terrestrial purposes for some time, when Galileo, having constructed one on an improved principle, merely from description, as he had never seen one, applied it to the observance of the celestial bodies; it opened a world of wonders to his view of which he had previously no conception. The discoveries he made fully convinced him of the correctness of the Copernican theory, and this he had the courage to avow in the most public manner. But bigotry, that foe to truth, laid its iron hand upon him, and he was thrown into the prison of the Inquisition, where he was detained several months, and compelled to promise that he would renounce his terrestrial opinions, and not teach or defend them, either by word or writing. A promise extorted by fear of death he did not consider binding, he therefore ventured, about seventeen years after, in 1632, to publish at Florence the dialogues of the two great systems of the world, the Ptolemaic and the Copernican.

The vigilance of persecutors seldom relaxes. He was again brought before the terrible tribunal and committed to their loathsome dungeons, where he was confined two years; his books were burnt at Rome, he was compelled to recant his sentiments, and enjoined a ridiculous penance as the condition of his release. This great man made many interesting observations on the moon, discovered Jupiter's satellites, Saturn's ring, the spots on the sun's

disc, by which he ascertained that that luminary turns on his axis, and that the nebulae and milky way consist of stars at such an immense distance that they cannot be distinctly seen with the unassisted eye. He died in 1642.

The following interesting article on his trial appears in the *Revue des Deux Mondes*, and an Italian, M. Berti, has lately brought to light from the archives of the Vatican, some important documents relating to the subject. It has been disputed whether Galileo was actually tortured. Being interrogated a second time on the 21st of June if he maintained or had ever maintained the opinion that the sun is the centre of the world and the earth moves, he replied humbly that since his arrest by the Congregation of the Index in 1616 he had always held, and still held, for "very true and indubitable," the opinion of Ptolemy. This reply not appearing satisfactory, the Father Commissioner insisted on knowing the truth, and declared that, if it was not told fully, torture would be applied. "I am here to obey," replied Galileo, in a kind of terror. The text then indicates that there was still more rigorous treatment of him. "As it appears that you have not spoken the whole truth on the subject of your intention, we have judged it necessary to come to the rigorous examination." Now, the rigorous examination was purely and simply torture. Still, it seems improbable that this was actually carried out, otherwise a full account of it, as usual with rigorous examinations, would have appeared in the reports of the trial. All that the victim underwent and said was usually recorded with great precision by a clerk. It is unlikely that the rigorous examination would have been carried out in Galileo's case, without a clerk being present, or that the clerk being present would have made no mention of it; or again, that the account of torture would have been suppressed by the Holy Office. Galileo was probably spared on account of his age and infirmities. M. Berti attributes this wholly to the humanity of the Commissioner. M. Mezières (the writer of the article) considers this would be to unduly calumniate the Pope, Urban VIII. It appears clearly from the whole that the menace of torture was a reality, and not merely a means of striking the imagination of the public.

To be Continued.

BRITISH HOROLOGICAL INSTITUTE.

THE Half-yearly General Meeting of the members of this Institute was held on the 16th ult. Mr. J. Jones, F.R.G.S., V. P., presiding.

The motion for the adoption of the report and balance-sheet having been carried, the chairman put to the meeting the proposition that Mr. Thomas Hewitt, of 4, Spencer Street, and Mr. Thomas Nelson, of 31, Halton Road, be elected to fill vacancies in the Council, and declared it carried.

Mr. R. Bridgman and H. D. Corker were re-elected auditors, with thanks for past services.

A vote of thanks was passed to Professor Tennant for his address on the occasion of the visit of the members to the Wakefield Tower, and acknowledged by Professor Tennant.

Votes of thanks were also accorded to the secretary and to the chairman for presiding.

At the usual Monthly Meeting of the Council of the same Institute, held on the 9th ult., it was announced that the Clockmakers' Company had resolved to contribute Ten Guineas a year to the funds of the Institute. That Baroness Burdett Coutts had signified her willingness to contribute £300, towards the Building Fund; and that in accordance with the request of the Council, the Turners' Company would this year offer their prizes for turning in gold, steel, and brass, connected with horological instruments. With a view of assisting the Turners' Company, it was resolved that the Institute be placed at their disposal for the reception of articles sent in for competition.

THE GOLDSMITHS' COMPANY'S PRIZES.

THE designs and models sent last year in competition for the Goldsmiths' Company's prizes are now displayed at the Architectural Museum, Tufon Street, Westminster.

Mr. J. Watkins, of Chelsea, receives a prize of 50*l.* for an excellent and harmonious design for a shield. Another 50*l.* prize is awarded to Mr. W. Marshall, for a model of a casket for gems. A design for a loving cup, to be executed in silver, partial gilt, by Mr. J. Eyre, secures a prize of 25*l.* Mr. A. M. Mowbray received an award of 10*l.* for the design of a pastoral staff. For executed silver work, two 25*l.* prizes were received by Mr. L. Angel; and an extra prize of 25*l.* by Mr. Alexander Crichton. Designs for clock cases were also sent by Mr. Walter Langley, of Birmingham, and Mr. G. Daniels, of Pitfield Street, Hoxton.

THE

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HAVE REMOVED TO

64, HOLBORN VIADUCT,

(Opposite the London, Chatham and Dover Railway Station),

LONDON, E.C.

SPECIAL NOTICE.

IN future, copies of the WATCHMAKER, JEWELLER, AND SILVERSMITH, will be supplied to the Retail Trade, Booksellers and Newsagents, by Messrs. Catty and Dobson, Wholesale Booksellers, 1, Ivy Lane, Paternoster Row, London.

AMERICAN TRADE ITEMS.

The *New York Jeweller's Circular* says:—

“Conch-shell jewellery is in great demand.

“Gold scarf pins are fashionable for ladies.

“Since the Centennial, mosaic jewellery has risen in favour.

“Turquoise jewellery set in gold or silver is quite fashionable.

“The favourite gold thimbles have tops made of some precious stone, with initials set in the edge.

“A new jewel case is made to represent a table; the legs and sides of silver, the cover of glass, and the box lined with tufted satin.

“Silver watches seem to be unpopular in Philadelphia. Only 493 are assessed in the whole city, while the number of gold watches is 14,446.”

A NEW BRITISH SCHOOL OF JEWELLERY has been established at Rome, for the perfect imitation of ancient and mediæval works of art in gold and silver and precious stones. Each object is so executed as to show by its style to what epoch and nation it belongs. To effect the aim in view by this school, much, however, has to be discovered, as ancient jewellers used chemical and mechanical agents unknown to us. Amongst other arts connected with the craft, the old processes of melting, soldering, and wire-drawing, remain a problem, as also how to join and separate hardly perceptible pieces of gold.

A GUILLESS JEWELLER.

A PERFECT novelty in the art of swindling has recently been brought out in a town in Italy, and, as a similar *ruse* might be played upon the very sharpest tradesman in London, an account of the mode of proceeding may be of interest to the residents of Bond-street and other parts. Some time since a very gentlemanly-looking man, accompanied by his daughter, a good-looking young lady, of about 18 summers, alighted at the chief hotel of the town. They gave themselves out to be English, and had, among other luggage, four large boxes, containing two complete sets of drawers, like those used by officers in camp. They chose a salon and two bedrooms, one of which opened into the salon. As soon as they were settled these drawers were unpacked, and one set was placed against the door in the salon, the other on the other side of the door in the gentleman's bed chamber, the door in question being (like most of those in continental hotels) very thin. For some time all went on very satisfactorily. The gentleman was not extravagant, but liberal, and was most particular in calling for his bill every week and paying it to the moment. Before he had been many days in the town he paid a visit to the principal jeweller, and made some small purchases—in each case paying cash and showing that he was well provided with bank-notes. The jeweller was most anxious to press his new customer, and brought out all kinds of beautiful articles to tempt him, but at first his purchases were moderate, though liberally paid for. At the end of a month the gentleman paid a visit alone, and, after making another purchase, observed that his daughter was about to be married and that he thought of sending to Paris for a set of diamonds. The jeweller could not allow such a chance to slip through his fingers. He had the most beautiful set in Europe, the property of a Princess; he was sure that only a Milord Inglese could buy them, and begged his customer just to inspect them. The price was only 400,000fr. The inspection was made, but no decision was come to that day. The next day another inspection was made and Milord agreed to take them. The jeweller was delighted. He thought it would be best to ask if he should send them round that evening, but he received a perfectly straightforward answer. “I do not keep so much money about me. I must draw upon my bankers in London. I will give you 500f. to close the business, and the jewels you can deliver against cash in the course of next week.” The deposit was paid, and the jeweller satisfied beyond a doubt that he was dealing with a most perfect gentleman. Eight days after, he was requested to call the same morning at 11 and bring the diamonds, for which he would be paid. He arrived at the moment and found his customer in his dressing-gown, sitting alone at the set of drawers referred to, a front flap of which turned down so as to form a writing table. The jeweller advanced respectfully, and laid the casket open on the flap in question. “Milord” just examined the jewels, remarked that of course he did not wish his daughter to know anything of the transaction at present, and then proceeded to take out a large handful of beautiful crisp notes. At that moment the door opened, and in bounded the young lady in question, as the jeweller afterwards said, “just like a golden fawn.” Nothing was more natural than that “Milord” should close up the flap, and ask the young lady to go away, as he wished to be alone. But she was a spoilt child and would have her own way. She had come to tell “papa” that the tailor was waiting for him in the next room and he must go, and that she was quite sure the jeweller would like her company better than his; besides, she had a locket she could not open, and the jeweller must help her. The jeweller was not proof against the playful charms of the young lady; he saw his goods safe, not exactly under his eye, but next door to it. So he begged her father to go, and he would wait. “Milord” left the room and the poor dupe enjoyed half an hour of delightful flirtation with the young lady. There was something very winning in her ways, and then she was a young bride. The time passed like a dream and at last the young lady passed off to go and hurry her father. The jeweller sat in meditation; his thoughts were at first all engrossed with the sweet girl who had just left. Then he began to wonder how long his customer would be. Then he went and tried the flap of the drawer. It was “all right;” it was locked. So he sat down and mused again. After some three hours he began to think that he must be forgotten. So he rang the bell and requested the waiter to just remind “Milord” that he was waiting, but to do it very politely. The waiter replied that “Milord” and the Signorina had gone out an hour ago. There was nothing to do but to wait, and wait he did. Neither returned. *Table d'hôte* passed, and although the poor man began to have a presentiment that something was wrong, the landlord was consulted, but was sure that his guest was a real gentleman, whose only fault was forgetfulness. So again he waited until past the small hours of the night. At early morn-

ing the landlord again returned and he also began to think the case suspicious. The jeweller was furious. He made a dash at the drawers, and, with the aid of the poker, broke open the flap. His next move was to take the casket. He thrust his head into the compartment, and sank back into the arm-chair. He saw before him nothing but a square open void, leading into the set of drawers in the next room. The landlord did likewise, and so did the waiters. Then they sat and looked at each other, and at last ordered restoratives for the jeweller, who had fainted.

GREENWICH TIME.

WE are glad to find animated discussions being held in reference to the best and most effectual means of controlling public clocks, since such must tend to stimulate a fair and honest competition which will result in the public having advantage of the best method. We do not necessarily identify ourselves with any particular system, but will be glad to find that which *proves* itself the best, universally adopted, and therefore in justice to all methods we extract the following correspondence which has recently appeared on the subject in the *Times*. Mr. Piazzzi Smith, Astronomer-Royal for Scotland, writing to that journal from the Royal Observatory, Edinburgh, with regard to an account published in its columns that hitherto all attempts to regulate clocks by electricity have failed to yield practical results, says:—"Many public clocks in Edinburgh have been for sixteen years past, and are still, most successfully controlled, synchronized, and made to show true time, not only every hour, but every second, by electricity. One of these clocks, too, performs the exceedingly practical work of pulling the trigger of the time-gun in the Castle of Edinburgh every day, proving thereby to the whole community, by reference to the other electric and independent signal, the time-ball on the Calton Hill, whether the Castle clock is, or is not, most truly and efficiently regulated by its current of electricity; while so far as the cheaper, but rougher, method of correction by the minute hand, of an ordinary clock not necessarily showing seconds being placed true by electricity once an hour is concerned. Edinburgh may refer with melancholy pride to her late citizen and most inventive genius, Alexander Bain, whose claim to the invention of precisely that apparatus was maintained in print no less than thirty-four years ago by Mr. John Finlaison, Government actuary and calculator. I would, moreover, beg to inform anyone who desires to employ that method of electric clock regulation, that he has only to apply to the clockmakers long employed in this Royal Observatory, viz., Messrs. J. Ritchie & Sons, 25 Leith Street, Edinburgh, and they can fit him up at once any number of such clocks, according to a very moderate scale of prices long since arranged."

Extract from the *Times*, Wednesday, January 24th, 1877.
"Messrs. Barraud & Lunds write from 41, Cornhill, E.C.:—Please allow us a small space to assert the perfect correctness of your statements under the head of 'Greenwich Time' on the 15th inst. Your notice in no way ignored the existence of electric clocks, but it stated an undeniable fact, that no system which had been yet tried had satisfied the requirements of commercial and daily demands, or come into general and practical use. The clocks now going in Edinburgh have the one defect which will exclude all on the same principle from receiving universal support—any injury to the line wire stops every clock in connection with it. As regards Mr. Bain's invention it is quite true that he very wisely went at once to the setting of the hands, but he attempted it so clumsily that it was a total failure. Anyone who wishes to do so may willingly examine our system and compare it with the drawings in the pamphlet mentioned by Mr. Piazzzi Smith. The result, will soon give the matter the best possible test, as the whole city will soon be traversed with our system which has received the unqualified and unexcepted approval of every telegraph and railway engineer who has seen it."

EXHIBITIONS OF FANS.—An Exhibition of Fans is to open at Munich, on November 1, 1877. It will last three months, and will comprise contributions from all countries. Some remarkable specimens are promised from different towns in Europe; that of Gratz, in Styria, among others, will lend the fine collection of the Johanneum. Next to China (a Paris paper says) France is the country that produces the most fans. Before the Revolution there was a corporation comprising one hundred and thirty makers. The seat of the manufacture is in the Department of the Oise between Metu and Beauvais, where more than 3,000 workers gain a livelihood by mounting Paris fans. The frames of plain or carved wood are made in the same villages.

MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Bankrupts.

LIQUIDATIONS BY ARRANGEMENT OR COMPOSITION.

JACOBS, SIMON, Middlesborough, jeweller. December 16. J. W. Teale, Solicitor, Middlesborough.
SMITH, WILLIAM, Borthwick, Coventry, watch manufacturer. December 28. O. Minster, solicitor, Coventry.
GRANGE, JOHN WILLIAM, 3 Chapel Walks, Preston, jeweller and general dealer. January 2. J. Forshaw, solicitor, Preston.
HAYHURST, GEORGE, Stretford New Road, Manchester, watchmaker and jeweller. January 3. J. L. Hodgson, solicitor, 16 Tib Lane, Manchester.
NIBBOLS, ALFRED LATIMER, 4 St. Leonards Terrace, Streatham, watchmaker. January 1. L. A. Wenn, solicitor, 14 Bell Yard, Temple Bar.
SENECAL, LOUIS, 261 Brompton Road, watchmaker and jeweller. January 6. T. Guscotte & Co., solicitors, 121 Bishopsgate Street Within.
YOUNG, JAMES, Knaresborough, watchmaker. January 1. Simpson and Burrell, solicitors, Leeds.
ROLAND, WILLIAM, 1 Caroline Street, Birmingham, late 368 City Road, London, gilt jeweller. January 10. Southall, Thomas, & Southall, solicitors, Birmingham.
SPARKS, RICHARD, 37 Wilmington Square, enameller. January 8. L. Barnett, solicitor, 23 New Broad Street.
WILKINSON HENRY, Blackburn Road, and Wellington Terrace, Accrington, jeweller. January 11. J. H. Tattersall, solicitor, Blackburn.
BRITTON, SAMUEL ABRAHAM, 40 Beaumont Square, Mile End, late 10 Tenter Street North, Goodman's Fields, jeweller. January 15. J. M. Green, solicitor, 82 Queen Street.
HERBSTREIT, JOSEPH, Cranford Street, Smethwick, clock and watch-maker, &c. Burton, solicitor, Union Passage, Birmingham.
BLANCHARD ALFRED, 3 Arabella Row, Pimlico, jeweller. January 22. At Guildhall Tavern, Gresham Street, February 6 at 3. E. Froggatt, solicitor, 6 Argyll Street, Regent Street.

Trustees Appointed.

BELL, ADAM (Liq.) Union Road, Oswaldtwistle, cotton manufacturer and watchmaker (separate estate). Trustees, John White, Manchester, accountant, and Edward Rushton, Blackburn, auctioneer.
SMITH, WALTER, trading as W. SMITH & Co. (Liq.), Derby, watchmaker. Trustee, Thomas H. Harrison, Derby, accountant.
WALKLAND, JAMES (Liq.), Hull, silver plater. Trustee, Elias Needham, Norfolk Street, Sheffield, accountant.
WILLIAMS, ALFRED, trading as ALFRED WILLIAMS & Co. (Bkt.), Hartington Buildings, Birmingham, jeweller. Trustee, Spencer Dominey, Waterloo Street, Birmingham, accountant.
FEE, JOHN (Bkt.), Sheffield, silver plate manufacturer. Claims by January 31 to E. Needham, Sheffield, accountant.
SHEPPARD, CHARLES (Liq.), High Street, Lewes, jeweller. Claims by January 29, to W. N. Fisher, 4 Waterloo Street, Birmingham.

Dissolutions of Partnership.

BRADLEY, SAMUEL, and MOTT, THOMAS LONDON, Vyse Street, Birmingham, jewellery factors.
BEDFORD, WILLIAM and CARTWRIGHT, JOSHUA EDWARD, Harford Street, Birmingham, jewellers.
WHITE, JAMES, Glasgow, opticians, &c. December 30. Debts by James White, who continues the business.
BRULL & ROSSMAINTH, 32 Ely Place, Holborn Circus, diamond merchants and jewellers. November 30.
DAVIS A. J. & Bros., 139 Deangate, and 1A Mulberry Street, Manchester, jewellers. November 29.
MENDOZA & COHEN, 4 Paradise Street, Liverpool, jewellers. December 1. Debts by Henri Mendoza.
OWEN, ROBERT, & Co., Victoria Mills, Corporation Street, Sheffield, manufacturers of silver plated and Britannia metal goods. November 25.

Adjudications of Bankruptcies.

WILLIAMS, ALFRED, trading as ALFRED WILLIAMS & Co., Hartington Buildings, Branstons Street, Birmingham, manufacturing-jeweller. December 30.

Dividends.

WHITTAKER, JOHN (Liq.), Oldham, jeweller. 1st and final div. 2s. 6d.: W. Newton, Peter Street, Oldham.
FOXALL, GEORGE (Liq.), Beckenham, late Thavies Inn, jewellery-factor. Div. 1s. 6d.; F. Page, at—Letts, 8 Bartlett's Buildings, Holborn Circus, sol.
FAIRLEY, JOHN (Liq.), Coventry, watch manufacturer. 1st and final div. 6d. H. Merrick, High Street, Coventry.
WALKLAND, JAMES (Liq.), Hull, silver plater. Div. 2s.; E. Needham, 121 Norfolk Street, Sheffield.
STEPHEN, CHARLES (Seq.), Glasgow jeweller, equalizing. W. D. Quick, 75 Bath Street, on and after, January 25th.
CRICHTON, ARCHIBALD (Bkt.), Capel Street, Dublin, jeweller. A div. 4d. on £466. O.A., C. H. James. Solicitors, Fay, McGough & Co.
MUIRHEAD, LEWIS P. & Co., (Seq.), Glasgow, goldsmiths. 1st, Miller and Ferguson, 71 Queen Street, Glasgow, February 19.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

29. WILLIAM GILLET and CHARLES BLAND, both of Croydon, in the county of Surrey, Clock Manufacturers, for an invention of "Improvements in clocks and other time-keepers."—Dated 2nd January, 1877.
74. WILLIAM EDWARD GEDGE, of 11, Wellington Street, Strand, in the county of Middlesex, Patent Agent, for an invention of "Certain improvements in watch-case springs."—A communication to him from abroad by Joseph Britton, of San Francisco, California, in the United States of America, Gentleman.—(Complete Specification.)—Dated 8th January, 1877.
140. JOHN MATTHEW MAY, of Hatton Garden, in the county of Middlesex, Merchant, for an invention of "Improvements connected with the manufacture of clock-cases, barometer-cases, thermometer-cases, and other like cases."—Dated 11th January, 1877.
157. DERWAS OWEN JONES, of Pontisford, in the county of Salop, for an invention of "Improvements in the construction of safes, chiefly for securing the property of jewellers and diamond merchants, and other valuables."—Dated 12th January, 1877.
186. JOSEPH HILL, Manufacturer, of Birmingham, in the county of Warwick, for an invention of "Improvements in the manufacture of solitaires."—Dated 15th January, 1877.
191. HARRISON MILL FRODSHAM, of the Strand, in the county of Middlesex, Chronometer Maker, for an invention of "Improvements in equi-motive escapements for watches, clocks, and other timekeepers."—Dated 15th January, 1877.
296. JOHN THOMAS NICHOLLS, of Southampton Buildings, Holborn, for an invention of "Improvements in watch-guards or protectors."—Dated 24th January, 1877.
313. SAMUEL VICKERY and JAMES THOMAS WHITE, both of Clerkenwell, in the county of Middlesex, Watchmakers, for an invention of "Improvements in the construction and adjustment of chronometers, watches, clocks, and other timekeepers."—Dated 25th January, 1877.

Grants of Provisional Protection for Six Months.

4900. To JAMES JOSEPH HICKS, of Hatton Garden, in the county of Middlesex for the invention of "Improvements in thermometers."
5002. To WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake & Co., Patent Agents, Southampton Buildings, London, for the invention of "An improved machine for engraving and chasing jewellers' and silversmiths' work, and for other like purposes."—A communication to him from abroad by Albert H. Watkins and Frederick A. Brown, both of Boston, Massachusetts, United States of America.
157. To DERWAS OWEN JONES, of Pontisford, in the county of Salop, for the invention of "Improvements in the construction of safes, chiefly for securing the property of jewellers and diamond merchants, and other valuables."
191. To HARRISON MILL FRODSHAM, of the Strand, in the county of Middlesex, Chronometer Maker, for the invention of "Improvements in equi-motive escapements for watches, clocks, and other timekeepers."

Inventions protected for Six Months on the Deposit of Complete Specifications.

74. WILLIAM EDWARD GEDGE, of 11, Wellington Street, Strand, in the county of Middlesex, Patent Agent, praying for Letters Patent for the invention of "Certain improvements in watch-case springs."—a communication to him from abroad by Joseph Britton, of San Francisco, California, in the United States of America, Gentleman,—was deposited and recorded in the Office of the Commissioners on the 8th day of January, 1877, and a Complete Specification accompanying such petition was at the same time filed in the said office.

Notices to Proceed.

3436. FREDERICK WEINTRAUD and RICHARD JAMES SECUNDUS JOYCE, of 18, Aldermanbury, in the city of London, Manufacturers, have given notice in respect of the invention of "Improvements in solitaires or sleeve and collar studs."
3785. GEORGE EDWARD PRITCHETT, of 39, Lombard Street, in the city of London, Architect, has given notice in respect of the invention of "New or improved means, apparatus, or appliances for utilising clocks, clock-work, or time-keeping movements, so as to put the same in communication with distant buildings, rooms, ships, mines, or places."
4811. JOHN COMPTON WEEKS JEFFERYS, of Tottenham Court Road, in the county of Middlesex, Manufacturing Jeweller, has given notice in respect of the invention of "Improvements in studs, solitaires, purses, clasps, gloves, bags, harness, and other fastenings or ornaments for dress."
74. WILLIAM EDWARD GEDGE, of 11, Wellington Street, Strand, in the county of Middlesex, Patent Agent, has given notice in respect of the invention of "Certain improvements in watch-case springs."—A communication to him from abroad by Joseph Britton, of San Francisco, California, in the United States of America, Gentleman.

Patents on which Stamp Duty of £100 has been paid.

33. CHARLES LOUIS THIERY, of Boston, Massachusetts, United States of America, for an invention of "Certain new and useful improvements in the manufacture of watch cases, and in machinery for producing the same."—Dated 4th January, 1870.

Patents on which the Stamp Duty of £50 has been paid, and Dates of their Production for Certificate.

359. WILLIAM WEST, of Birmingham, in the county of Warwick, Jeweller, and WILLIAM FREDERICK SPITTLE, of Birmingham aforesaid, Manager of Works, for an invention of "Improvements in solitaires, sleeve-links, and other like dress fastenings."—Dated 28th January, 1874.
378. GEORGE HENRY WILSON, Watchmaker, in the employ of the firm of H. W. and L. Dee, of Sherwood Street, Golden Square, in the county of Middlesex, for an invention of "Improvements in keyless watches and in appliances for winding the main-springs, also for setting the hands thereof."—Dated 29th January 1874,

Patents which have become Void.

123. ALFRED COURVOISIER JONAS, Watch and Clock Manufacturer, of Chaux-de-Fonds, in the republic of Switzerland, for an invention of "Improvements in double-faced watches."—Dated 15th January, 1870

Patents Granted in Foreign States.

FRANCE.

- 114,418. ZULOGA, for "Improvements in damascening iron, steel, and other metals with gold and silver."—Dated 2nd September, 1876.
- 114,537. HOPKINS, for "Improvements in watches."—Dated 12th September, 1876.
- 114,641. MORLOT, for "Manufacturing jewellery articles."—Dated 19th September, 1876.
- 114,662. DUMYRAT, of Lyons, for "A clock-bell."—Dated 23rd September, 1876.
- 114,682. WALKER, for "Improvements in fastenings for solitaires, sleeve links, collar and other studs, gloves, bags, and other articles."—Dated 20th September, 1876.—(English Patent, 24th March, 1876.)
- 114,703. NAYENER, of Pierrefontaine, for "A tool for holding clock-springs."—Dated 30th September, 1876.
- 114,729. GULMET, for "A clock with conical oscillation and a balanced reaction-pendulum."—Dated 26th September, 1876.
- 114,811. ROLET, of Besançon, for "Compass-watches."—Dated 6th October, 1876.

BELGIUM.

- 41,147. Miss DOMON, for "A remontoir watch."—Dated 26th December, 1876.

UNITED STATES.

6270. MILAN C. BULLOCK, of Chicago, Illinois, United States, for "Swivel head for diamond drills." (Griffe de foret à diamant.)—5 years.—Dated 10th July, 1876.

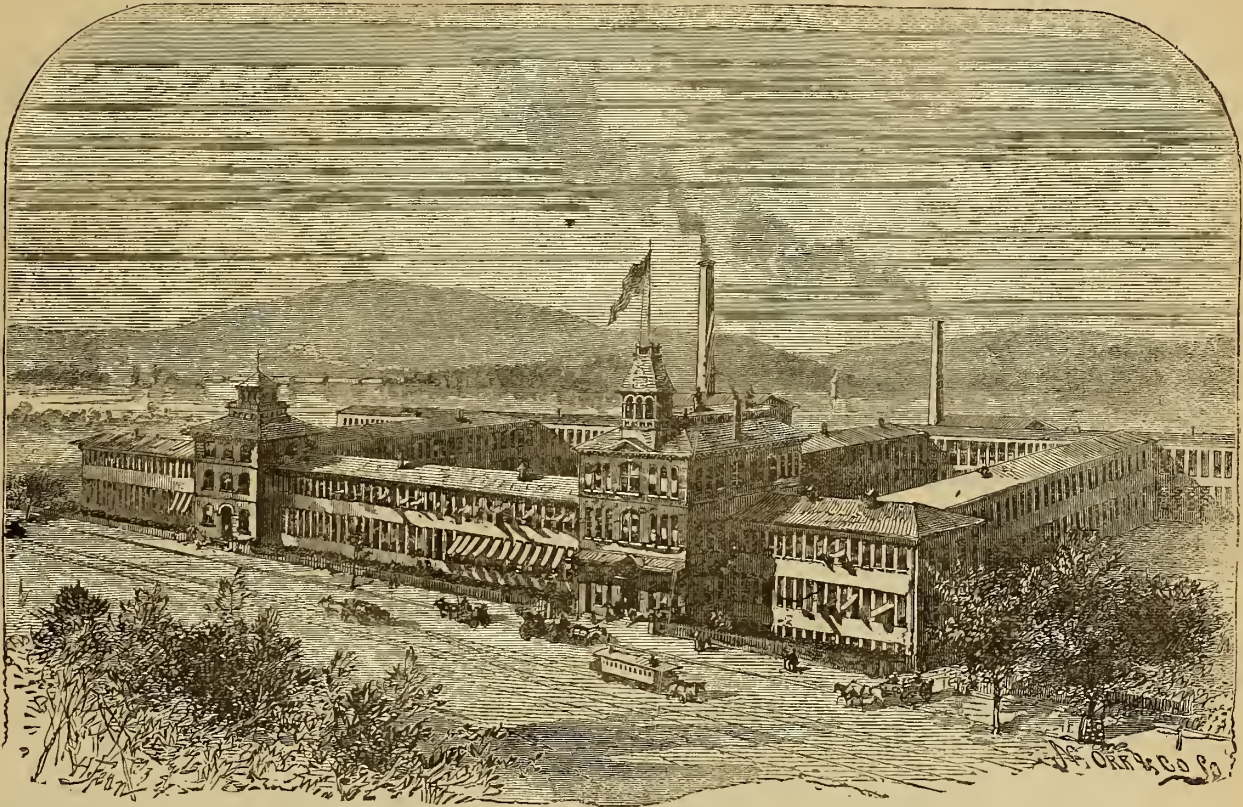
Patents Sealed.

2926. HERBERT JOHN HADDAN, of the firm of Herbert and Company, Patent Agents, of 67, Strand, in the city of Westminster, Civil Engineer, for an invention of "Improvements in chronometer escapements."—A communication to him from abroad by F. Herman Voigt, of Buffalo, state of New York, United States of America, Watchmaker.—Dated 18th July, 1876.
2992. THOMAS MORGAN, Secretary of the Inventors' Patentright Association, Limited, 21, Cockspur Street, Charing Cross, in the county of Middlesex, for an invention of "Improved watch keys."—A communication to him from abroad by John S. Birch, of New York, United States of America.—Dated 14th July, 1876.
2913. HENRY MATTHEW ROBOTOM, of Liverpool, in the county of Lancaster, for an invention of "Improvements in the manufacture of keyless watches."—Dated 17th July, 1876.
3973. CHARLES PAYNE, and PETER STEEL, both of the city of Manchester, in the county of Lancaster, for an invention of "A new or improved device or means for securing scarf pins, brooches, and other descriptions of jewellery."—Dated 14th October, 1876.
2958. JOHN ALFRED LANGSTON, of Tavistock Street, Bedford Square, in the county of Middlesex, Architect, for an invention of "Improvements in illuminating clocks."—Dated 20th July, 1876.
3113. HENRY PEARCE, of Huddersfield, in the county of York, Jeweller, and WILLIAM HENRY DOUGLAS, of Stourbridge, in the county of Worcester, Jeweller, for an invention of "Improvements in studs and solitaires."—Dated 4th August, 1876.

Designs Patented in the United States.

9243. JAMES D. LYON, of Grand Rapids, Michigan, for a "Watch-chain charm."—Application filed 16th March, 1876.—Term of patent 3½ years.
9244. PHILLIP C. MASI, of Washington, D. C., for a "Jewellery-pendant."—Application filed 8th April, 1876.—Term of patent 3½ years.
9247. WILLIAM W. SCOTT, of Pittsburgh, Pa., for a "Watch-chain charm."—Application filed 1st March, 1876.—Term of patent 3½ years.
9256. GEORGE M. SAVAGE, of Detroit, Michigan, for a "Watch-chain charm."—Application filed 5th April, 1876.—Term of patent 7 years.

"By hand-labour it is impossible for this country to compete with Switzerland in the Watch Trade; and, if we would hold our own in Europe in this branch of industry, we must follow the example of the Americans, who have successfully used machinery in the manufacture of Watches."—*Extract from the "Times" of December 18, 1868.*



"The section which conspicuously brings out the enormous strength of America as a producing power is that of tools; and still more especially the vast array of machine tools for metal, which are the parents of all other machines—more than 100 exhibitors have each a group that commands the admiration of all who take the trouble to examine them in detail. These tools are for all purposes: small arms, sewing machines, clocks, watches, and all branches of machine making and engineering, and almost all are finished in a style superior to that of any former exhibition. Probably the most exquisite set of machine tools ever made is that exhibited by the American Watch Company, of Massachusetts. No mere words can convey an idea of their high standard of excellence; they must be felt and handled. What the Whitworth gauges are to true circles, these lathes and tools are to all forms required in the manufacture of watches. Add to this, great convenience in arrangements and fixtures to produce the parts of a watch so exact as to be almost interchangeable."—*The Times*, October 28th, 1876.

FOR PARTICULARS APPLY TO

ROBBINS & APPLETON,

GENERAL AGENTS,

WALTHAM BUILDINGS, HOLBORN CIRCUS, LONDON, E.C.

THE WATCHMAKER, JEWELLER, SILVERSMITH, AND KINDRED TRADES' DIRECTORY.

The important feature of our Directory Columns will be found to be a most effectual method of keeping the Names of Firms and Manufacturers before the constant notice of the Trade.

No Charge is made for Insertion of a Two-line Entry of Name and Address of Firms whose advertisements, occupying not less than one-third of a page, appear for twelve consecutive months. In other instances, the Charge for the Two-line Entry of Name and Address is £1 ls. per annum; four lines, £1 10s. per annum; six lines, £2 2s. per annum. No Charge is made for the heading or title under which any entry appears.

AMERICAN (WALTHAM) WATCHES.

FATTORINI & SONS (Wholesale Factors) Watch and Chronometer Manufacturers, Bradford, Yorkshire.

BAROMETER AND THERMOMETER MAKERS.

MURRAY & CALLIEU, 22, St. John's Square, E.C.
NEGRETTE & ZAMBRA, Holborn Viaduct, E.C.; Charterhouse Street, E.C.; 45, Cornhill, E.C.; 122, Regent St. W.
WEBSTER, J., 88, St. John Street Road, Clerkenwell, E.C.

BURGLAR AND FIRE PROOF SAFE MAKERS.

CHATWOOD'S, 120, Cannon Street, E.C., and Lancashire Safe and Lock Works, Bolton.
GEERING & TALBOT, Apollo Safe Works, Moseley Street, Birmingham.
PHILLIPS & SON, Speedwell Works, Sherborne Street, Birmingham.
THE SICKER SAFE AND STRONG ROOM COMPANY, LIMITED, Soho, near Birmingham.
WHITFIELD (F.) & CO. Whitfield's Patent Screw Bolt and other Safes, Viaduct Works, Oxford Street, Birmingham.

CLOCK MAKERS.

BRUGGER & STRAUB, 79, High Holborn, W.C.
CAMERER, KUSS, FRITSCHLER & CO., 522, Oxford Street, W.C., and 2, Broad Street, Bloomsbury, W.C.
COHEN (JACOB) & CO., 36 and 37, Ely Place, E.C., and Charterhouse Street, E.C., London; and 10, Rue Béranger, Paris.
GILLET & BLAND, Steam Clock Factory, White Horse Road, Croydon. Exhibition Medal, 1873. Makers (to her Majesty's Government) of Worcester Cathedral Chimes at Bradford and Rochdale Town Halls, Boston, St. Stephen's Church, Hampstead, &c.; and of Clocks of every description; also patent Carrillon Machines. Sole Proprietors and Makers of Patent No. 4141, for improvements in Church and other Bell Music. Established 1844.
GREENWOOD (JOHN) & SONS, Importers and Manufacturers of Clocks and Watches. Wholesale and for Exportation. Farringdon Road, near Clerkenwell Green, London, E.C.
SWINDEN & SONS, 27, 28 & 29, Temple Street, Birmingham.

DIAMOND MERCHANTS.

JONAS BROTHERS, 34, Ely Place, Holborn, London, E.C.
MARCUS (MAURICE) & CO., Waterloo House, Holborn Viaduct, London, E.C.
RUTHERFORD, JAMES, 2, Wilderness Row, E.C., and 33, Kirby Street, Hatton Garden, London, E.C.
WIEGEL, B., Jun., Diamond Merchant and Jeweller, 27, Wilmington Square, Clerkenwell. Diamonds and precious stones mounted or reset to the best advantage. Country Orders punctually attended to.

GILT JEWELLERS.

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HOROLOGY.

XXII.—A CHAPTER ON TIME.

WE are this month like some of those planetary bodies whose motions we occasionally allude to, forced somewhat out of our orbit by a disturbing cause. We regret this, for the only disturbance we care about is when we disturb ourselves, and that, even, is as seldom as we can possibly help. We think that it is "Sir Hudibras" who speaks of "the perils that environ the man who meddles with cold iron." His was the cold iron of the sword, whilst ours is slightly different. Scientific journalists are at certain periods very much in such a man's shoes, and have, now and then, to stepstone their way with unusual care, the subsequent statements amply showing what it is to meddle with the "cold iron" of horology. We are at times asked some very curious questions, questions, indeed, that would require treatises to answer. We should not be surprised if thirsters after particular kinds of knowledge expressed an earnest wish to learn what the other side of the moon was like; and whether any but the loveliest of the angelic sex could possibly exist on the planet Venus. Furthermore, whether the rising generations of Venus and Mars do not inter-marry, come to the Earth for their honeymoon, and ultimately settle here; how they manage to pass from one planet to the other, &c., &c. When we consider that the velocity of Venus is nearly 64,000 miles an hour through space, Mars 53,000 miles, and the Earth 65,500 "and odd," we had better leave the last-named question to subtler minds than ours. We are already burthened with about as much as we can comfortably stagger along under, as our readers shall judge. It has been said that a child may ask a question in *one minute* that

will take a philosopher months to answer properly. We very much fear that we are in the position of the philosopher at the present moment, for the questions that we are about to deal with cannot, certainly, be answered in either one month or two. These questions have been lying before us for a long time, and being pressed to clear them off the following is their purport:

"In what part of the globe does the date begin?"

"Supposing that we telegraph to the most distant points eastward and westward simultaneously, would the two messages arrive on the same date; or would the two opposite and distant places have the same date? If so, would such date be an earlier or later one than in England? If not, which of the two is earlier, and which forms the boundary?"

What do our readers think of those questions?

With respect to the first query as to "what part of the globe the date begins," we suppose that day must be meant. We thought that from what we have already written, the answer to such a question must have been given long ago; however, we will try what we can do again. We are of opinion that dates, very much like feminine fashions, are continually beginning at different places and different times. The fact is, that the beginning of the date is merely a question of meridian and anti-meridian, which we have touched upon several times before, and that there is no single place upon this earth where the date *begins* for all the other places; furthermore, that it is impossible it could be so.

We have said that the beginning of date, or day, was entirely a question of meridian and anti-meridian, and we will proceed to establish that truth.

For the purpose of this subject the Earth is a globe revolving on its axis once in every twenty-four hours, consequently every part of it must be respectively the highest and the lowest during that

time. The highest part is called the meridian of the place, and the lowest part we will call the anti-meridian. This revolution turns from west to east, and that makes the sun and stars appear to turn from east to west. We have, too, a horizon, which is the circle that divides the upper half of the sky, which we see, from the lower half which we do not see; the highest point is called the *zenith*, and the lowest the *nadir*. To exemplify this a little more clearly, suppose that we stood upon the very pole itself, then that would be our *zenith*, whilst the opposite point would be our *nadir*. These two last-named terms come to us from the Arabic, whilst pole (of the earth) is from the Greek *poleo*, to turn. Now, the globe is divided into certain spaces called degrees, 360 of which constitute the circumference; half of this division is 180 degrees, and a quarter is 90 degrees. Each degree is subdivided into 60 minutes—not of time, but of space,—a minute being again broken up into 60 seconds. A minute is a *nautical* or geographical mile, being $2,053\frac{1}{4}$ yards; and for ordinary purposes the degree is set down at 70 English miles, although not quite so much. A line drawn over the globe from north to south is called a meridian—from *medius*, middle, and *dies*, day—mid-day, because that highest point of the earth is nearest the sun at noon. We, however, are apt in our occasional thinking about these things more commonly to speak of the sun's rising and setting, and to that form we will keep for a short time.

In our meridian we see the sun at his highest point, which is noon to us, he then passes on to the west, and sinks below our horizon. On the following morning, he rises in the east—sooner or later, according to the season of the year—and proceeds as before. When he arrives at our meridian again, he has made what is called a solar day. But in connexion with the solar, there is another, and that is, the sidereal day. The sidereal day is composed of the period during which any selected fixed star crosses the line of our meridian twice. These fixed stars are so called, although nothing in the universe is absolutely fixed, because their distance from the earth is so immense that they have never been known to move since astronomy became a practical science. We stated in an elaborate paper called "Horological Telegraphy," which was published in this Journal, some interesting particulars that will serve anew to illustrate this part of our article. It must be borne in mind that every star rises and sets—that is, comes over our meridian from and to the same points of the horizon throughout the whole year. In contradistinction to this, the rising and setting of the sun are continually varying, as we all know. Each day a star reaches the same altitude at the instant of its passage across the meridian; but that of the sun is very changeable, and this ever-recurring change brings sidereal time and solar time into as constant difference. The astronomers, therefore, generally use the sidereal day, on account of its fixity, as a standard of measurement. The astronomer, in ascertaining his star-day, uses an instrument called the "Transit," or, the "Transit telescope," the latter being so carefully adjusted to the longitude of the place of observation, that it is exactly under the meridian of that place. In the focus of the telescope there is what is called a "diaphragm"—these Greek names do require so much spelling—meaning a fence across, composed generally of one horizontal and five vertical wires; the number may be either three, five, or seven, in order to give a central one. The observer, having adjusted his instrument for meridian and altitude, commences his observations. An astronomical clock is beside him, beating true seconds, and connected with his touch by electricity. He watches, and watches keenly, as the star nears the first vertical wire, marking the time on the clock recorder; and so for the next and next until the end. The middle wire indicates the supreme moment, but a mean of the passage of the star across all of them is mostly taken as the accurate time. That "mean" constitutes the astronomical noon, or 0, or twenty-four o'clock; and it is, also, our noon, but twelve o'clock. The instant after the transit, commences a new sidereal day. We thus see that this sidereal day is, practically, one revolution of the earth to a fraction of a second; the difference between the fraction and the absolute second being due to the eye and hand of the observer, but certainly not to the earth. And the dating, too, is different. Thus, our 9 o'clock in the morning on New Year's day, 1877, would be 24 o'clock, December 31, 1876, to the astronomer.

We have here two different parallel periods, namely, the solar day, and the sidereal day. Let us see how it is that the sun is not so correct a time-keeper as a star.

The sun does not describe his own motion with exactitude, the velocity being greater when it is at that point of its orbit called *perigee*, or nearest to the earth, than when it is at *apogee*, or farthest away. And it is this difference of velocity that makes the inequality of the solar day; in fact what we call the "proper" motion

of the sun—being unequal throughout the year—makes its days unequal also. There is, furthermore, another cause arising from the solstices and the equinoxes, which produces the same effect; that cause, it can be understood without a diagram, arises from the obliquity of the sun's motion; whilst a third one is to be found in the declination between zero and the solstitial points, or between 0° and $23\frac{1}{2}^\circ$, the angle within which the sun's motion is effected bearing from the ecliptic. These three causes are, summed up in astronomical language, as follows:—"The inequality of the diurnal motion of the sun, the difference in the direction of that motion, and the greater or lesser angular distance at which that motion is effected." They are, however, practically reducible to two causes; these are, the irregular motion of the sun in its orbit, and the obliquity of the ecliptic.

We have now, as has been shown, two separate astronomical days; namely, the solar, and the sidereal. The conflict between the different lengths of these days brings us to another important subject known to chronometer raters, and that is the Equation of Time. To the two days already explained we have to add a third, and that is the civil day, or the day of every day life. As we have gone far enough in the present paper, we will resume the subject in our next.

To be Continued.

ROYAL ASTRONOMICAL SOCIETY.

THE Annual General Meeting of this Society was held at Burlington House, on Friday the 9th ult.; W. Huggins, Esq. D.C.L., President, in the chair.

John Sydney White, Esq., 13 Bolton Gardens, South Kensington, S.W.; A. Mason Worthington, Esq., Sandiway House, Altrincham; and George Francis Hardy, Esq., Rothbury House, Stroud Green, Finsbury Park, N., were duly elected fellows of the society. The annual report of the society showed that the number of fellows had increased during the last year, and that the society was generally in a prosperous condition. Amongst the obituary notices was one of Miss Ann Sheepshanks, a sister of the Rev. R. Sheepshanks, who was for many years devoted to the society. During her lifetime Miss Sheepshanks founded, in memory of her brother, the well-known Astronomical Scholarship which bears his name, in connection with Trinity College, Cambridge. She also handsomely endowed the Cambridge Observatory, and at her death bequeathed to the Astronomical Society many valuable books from her brother's library.

After the reading of the Report the President said: It is probably known to all the fellows of the society that as none of the nominees for the medal have received the necessary majority of the votes of the council this year, no medal will be awarded. Without making any reference to the claims of the gentlemen whose names have been in nomination, I would suggest that it would be well that the award of the medal should not necessarily be regarded as an annual occurrence; but that, on the contrary, the medal should only be awarded from time to time when nominees come before the council who have special claims, and I think that in this way the prestige of the medal will be more certainly obtained. (Applause.)

The Society then proceeded to the election of officers by ballot, and the following gentlemen were declared to be elected:—As President: William Huggins, Esq., D.C.L., LL.D., F.R.S. As Vice-Presidents: J. C. Adams, Esq., M.A., LL.D., F.R.S., Lowndean Professor of Astronomy, Cambridge; Sir G. B. Airy, K.C.B., M.A., LL.D., D.C.L., F.R.S., Astronomer-Royal; Arthur Cayley, Esq., M.A., LL.D., F.R.S., Sadlerian Professor of Geometry, Cambridge; Edwin Dunkin, Esq., F.R.S. As Treasurer: Samuel Charles Whitbread, Esq., F.R.S. As Secretaries: A. Cowper Ranyard, Esq., M.A.; J. W. Lee Glaisher, M.A., F.R.S. As Foreign Secretary: Lord Lindsay, M.P. As Council: John Brett, Esq.; W. H. M. Christie, Esq., M.A.; Warren De La Rue, Esq., M.A., D.C.L., F.R.S.; J. R. Hind, Esq., F.R.S., Superintendent of the *Nautical Almanac*; E. B. Knobel, Esq.; George Knott, Esq.; William Lassell, Esq., LL.D., F.R.S.; E. Neison, Esq.; Captain William Noble; Rev. S. J. Perry, F.R.S.; Earl of Rosse, B.A., D.C.L., F.R.S.; Captain G. L. Tupman, R.M.A.

A RECENT contrivance for the protection of jewellery safes, is a net of telegraph wire spread all over them in electric communication with a powerful alarm bell. Any attempt to force the safe open, to drill its sides, to cut or remove the network, or to tamper in any way with the apparatus, sounds the alarm.

round temple where Apollo was worshipped, his mother Latona having been born in the island. *Ierne* signifies the end, the west, beyond, the extremity, as being the extreme limit of the then known world; it also means *Sacred*, which is supposed to be derived from the Persian, the word being the same in that language. In many of the old authors Ireland is called the "Sacred Isle," and the original inhabitants are generally considered to have been of Persian or Eastern origin; their round towers, and known worship of the heavenly bodies, seem to illustrate this theory.

Thomas Moore in his "History of Ireland," follows the legends of the early writers, he says: "During the reign of Tighernmas, gold is said to have been worked for the first time in Ireland; a mine of that metal having been discovered in the woods, to the east of the River Liffey." And in the oldest British records we possess, which are those of the "Four Masters of Ulster," under the date A.M. 3656, is the following: "In this year gold was first wrought by Tighernmas, King of Ireland, in the woods eastward of the Liffey; Uchadan, of the men of Cualan, was the artificer who first worked it, and by him were ornaments of gold and silver first made." (Cualan was the name of a district, on the eastern bank of the river.) We find from Strabo and Tacitus, that the invasion of Britain by the Romans was undertaken with the hope of obtaining the precious metals, the existence of which they had heard from the Gauls, and it seems apparent that at first they were disappointed, owing, no doubt, to the Britons withholding all information. Cicero, writing news of the expedition to Atticus, informs him of how much their expectations were disappointed, and that there was no hope of Quintus Tullius, a chief officer in the expedition, getting anything by it. He writes—"Etiam illud jam cognitum, neque argenti spiculum esse ullum in illâ insula, neque ullum spem prædæ nisi ex mancipiis." "This," says Cicero, "is already found out, that there is not a fragment of silver in that island, nor any hope of prize money, except from slaves." Again, "A Quinto fratre et à Cesare accepi ad 9 Kalend. Novemb. literas confectas Britannicæ obsidibus acceptis, nulla prædâ, imperata tamen pecuniâ, datas a litoribus Britannicæ." "I have had letters from Britain, both from my brother Quintus and from Cæsar, and hostages have been taken, and requisition made for money, but there will be no prize money."—Ep. Ad. Att. iv. 17.

It appears, however, that eventually the Romans certainly discovered it, both in England and Wales. Tacitus, in his "Vita Agricola," says "that in Britain are gold and silver, the booty of war!" Strabo also makes mention of it; but, independently of these, we have sufficient evidence of it in the Roman mines, which were worked for gold in several parts of the country, the most remarkable being that of "Ogofau," or "Gogofau," near Pumpsant, in Caermarthenshire. Here, situated on the left bank of the river Cothy, and forming part of the grounds of Dolau-Cothy, are the curious remains of mining supposed to have been undertaken during the occupation of Britain by the Roman Emperor Trajan. Here a quartz lode had been "worked open to the day," and "levels" driven 170 feet through the slate. The officers of the Geological Society also discovered the remains of a metallurgical workshop, and among other things, a beautiful gold necklace was found, which is now (or was) in the possession of Mrs. Johnnes, the wife of the owner of the property. One of the Welsh "Tryads," celebrates the heroic acts of three chieftains, Caswallan, Manawdan, and Llew Llawgyfies, who were distinguished by their golden cars, from which it seems natural to infer, that the mines of North Wales were worked by the Cymri at a very early period. It also seems certain that the Britons not only worked gold before the invasion of the Romans, but even coined it into money. Cymboline, Prince of the Trinobantes, is known to have coined money of gold, and the probability is, this was obtained in these islands. We have no fewer than forty of his coins, all of different dies, proving that he had at least forty different coinages, and must therefore have produced an immense amount of money; to say nothing of what was done by other kings. Sir John Pettus, in his "Fodiæ Regales," says, that Cymboline (or Cunobeline) obtained the gold from a mine in Essex, and minted it at Camulodunum. Many of these coins are preserved at the British Museum in London, and at the Ashmolean Museum in Oxford, and are all of pure gold, without alloy, and in a good state of preservation. Boadicea, Queen of the Iceni, is also said to have "extracted much gold out of minerals and earths," and to have worked the Essex mines; a coinage is also attributed to her, but on this antiquarians have disagreed. It is however certain, that her husband Prasutagus, was possessed of enormous wealth.

Money was certainly in use among the Britons upon the Roman invasion, because we find Cæsar forbidding all further coinage

of it, and establishing an imperial mint. And he himself records that before leaving Britain, "*Obsides imperat et quid in annos singulos vectigalis populo Romano Britannia penderet, constituit.*" (De Bell. Gall. v. 22). Dion Cassius, (lib. xl. sec. iii.) speaks of this yearly tribute; and Eutropius, (brev. vi. 17) records, that "*Julius Britannos, stipendarios fecit.*" Suetonius, (Vit. Jul. Cæs. xxv.) also distinctly affirms "*pecunias et obsides imperavit.*" Now, apart from this distinct mention of money, we can hardly imagine Cæsar imposing a yearly tax or tribute upon a people who were unacquainted with the precious metals, or the use of money; and, though some antiquarians believe the Britons first coined it for the purpose of paying this tax, they assign no reasons why they should have incurred the expense and trouble of this, instead of sending it in the form of bullion; also the coins of Cymboline (or Cunobeline) were struck previous to the Roman invasion,—that the tribute was for some time actually paid is stated by Diodorus, and from Strabo we learn that in the reign of Augustus, it was commuted for light export and import duties, on articles of commerce with Gaul.

It may interest our readers to know that not only was Britain famous at this time for her metallic wealth, but also for her pearls and precious stones. Julius Cæsar is said by Pliny and Suetonius to have set a high value on British pearls, and to have caused a shield to be made of them, which, being of rare beauty, he dedicated to Venus. Amethysts, diamonds, rubies, &c., seem also to have been found. *Jet* was also well-known under the name of *Gagates*. Solerius says, "Besides, to say nothing in this place of the many large and rich veins of metals of various kinds with which the soil of Britain abounds, the gagates is found there in great quantities and of the most excellent quality; if you inquire about its appearance, it is black and gem-like; if of its quality, it is exceeding light; of its nature, it flames with water and is quenched with oil; of its virtue, it has as great power of attraction when it is rubbed, as amber." The exports of this period seem to have been tin, lead, copper, silver, gold, furs, slaves, wicker-baskets, pearls, and dogs. Indeed, in this last article a large trade was carried on. The British beagle was highly prized on account of its excellent training for hunting purposes, and one Latin poet immortalized it in a somewhat pathetic manner, lamenting the ugliness and meanness of its appearance, and that the soul of such a dog had not a worthier or more handsome habitation!

The Romans are supposed to have worked gold in four localities: at the Ogofau mines, in Caermarthenshire; the Poltemore mines, in Devonshire; the Gold Scorp mine, at Newlands, in Cumberland; and the Lanarkshire Lead Hills, in Scotland. All are ancient workings of an apparently civilized people, but the Lanarkshire gold field is encircled by strong Roman camps, and is passed by a road as if it were under military protection; therefore, as we know that the Romans held possession of, and invaded this part of the country, under Agricola, it seems only natural to attribute the works to them.

In the reign of Henry III., a copper mine, which was worked at Newlands, in Cumberland, is said to have contained veins of gold, as well as of silver. The Patent Rolls in the Tower record several grants made by the sovereign to individuals for the privilege of seeking for gold and silver. In 1390, Richard II. granted to John Young, a refiner, all the gold and silver found in any mine in England, paying to the Crown a ninth part, to the Church a tenth, and to the lord of the soil, a thirteenth. Pennant says, "that in the reigns of James IV. and V. of Scotland, vast wealth was procured in the lead hills from the gold washed from the mountains." In the reign of the latter king it is said to have been not less than 300,000*l.* sterling. In 1526 James granted to certain Germans the right of working, under conditions favourable to the Crown Royalties, the gold and silver mines of Scotland for forty-three years. Elizabeth had previously made similar grants to Houghsetter, Thurland, and Schutz. In neither case, however, do we hear of gold having been discovered. Small quantities of the deep yellow variety have occasionally been picked up in Cornwall from the earliest times; and in the reigns of Edward I. and III., there were very considerable works at Combmartin, in Devonshire. Between 300 and 400 miners sent for out of Derbyshire were employed in them, and the produce was so considerable as to assist the Black Prince in his wars against France. In one part of Devonshire these miners gave the name of "Gold Street," and "Gold Field," to spots where lead and silver, but no gold, are still found, and it is probable that they worked over the valleys near North Molton, in which the Britannia and Poltemore mines are situated. A few years since, these mines gave rise to poetical prospectuses, speaking, almost singing, of "Pactolean streams, flowing through the lovely valleys of Devonshire, and holding out a realization of the fable of Colchis and the Golden Fleece."—*To be Continued.*

INLAND REVENUE PROSECUTIONS.

CHARLES KEMP, a jeweller, of Mare Street, Hackney, appeared in answer to a summons taken out by order of the Commissioners of Inland Revenue, charging him with dealing in plate without being licensed.—Mr. Martin appeared to support the summons on behalf of the Inland Revenue. The defendant was not represented.—The summons, it was stated, was taken out under the 30th and 31st Vict., commonly known as the Plate Act, and by this, dealers in gold and silver articles are required to take out a licence. The licence to sell articles of plate weighing under 2 ounces is 2*l.* 6*s.* per annum; over 2 ounces the licence is 5*l.* 15*s.* A breach of the Act renders the offender liable to a fine of 50*l.* The defendant held a licence to sell under 2 ounces, but had sold above.—Mr. Martin said that the case was now on the question as to whether only gold should be estimated, or whether the gross weight, gold and its alloy, should be taken. On behalf of the Inland Revenue, he had to contend that the gross weight had to be taken—that was to say, an article, as a watch-chain, manufactured of gold and silver, would, for the purposes of this Act, be considered all gold.—Mr. Bushby asked if a watch which was called a gold watch, though its works were known to be of steel, was to be taken at its gross weight.—Mr. Martin replied in the negative—the cases only would come under the Act. The same might be said of a chain made one link of iron and one link of gold. For the purposes of the Act only the gold would be weighed.—Hartley, an Officer of Excise, then deposed that, on Nov. 24, last, he went to the defendant's shop and asked to be shown a watch-chain value 12*l.* or 15*l.* He examined several, but decided that none suited, and the shopman offered to get by the following day two or three for his approval. He (the officer) went on the following day, and was shown a chain for which he subsequently paid 14*l.* 10*s.* He received a receipt (produced), and that certified the weight of the chain to be 2 ounces 17 pennyweights.—Mr. Martin said that was the case, with the exception of a witness to corroborate—the defendant had sold 17 pennyweights above what his licence allowed.—The defendant cross-examined the officer to show that he had refused to purchase on the first day because the chains shown, though of full value, did not weigh over 2 ounces, and that he had given his order for the chain to be got for his approval on purpose to trap him (defendant) into a breach of the law.—The witness said that it was a voluntary offer of the defendant's assistant.—The defendant, in answer to the charge, denied having sold above 2 ounces, and said he was prepared to prove that the gold in the chain did not amount to 2 ounces. He contended that the alloy did not count, and therefore he had not broken the law.—Mr. Bushby said that if the argument used by Mr. Martin was all he had to urge, he (Mr. Bushby) should rule in the defendant's favour. It seemed to him that to hold that alloy was to be counted as gold would be to let in a very curious state of things; for, on the grounds urged by the prosecution, a man who sold a pair of candlesticks made of bronze, but gold plated, might be held to deal in gold, because there was a coating of that metal. If there was any decision of a Superior Court on the point, he (Mr. Bushby) would be glad to hear of it.—Mr. Martin replied that there was no decision on the point.—The defendant produced a trade newspaper containing the report of a case at the Louth Petty Sessions, in which the same question was raised. Mr. Bushby, having looked at the case, remarked that he saw it was dismissed, the decision being against the Inland Revenue.—The defendant stated that in that case the Inland Revenue had expressed an intention of appealing, but never did so.—Mr. Bushby said the present summons would be dismissed on the ground stated.—Mr. Martin replied that, with all respect for the judgment of the Court, he felt bound to apply for a Case for the Superior Court.—Mr. Bushby said he would grant a case, and notice of appeal was then given.

THOMAS COOK, jeweller, Commercial Road East, was summoned at the instance of the Inland Revenue for selling to James Young, an Officer of Excise, a gold chain, the same being over 2 ounces, the defendant having a licence only to sell such an article under 2 ounces in weight.—Mr. Powell, barrister, appeared on behalf of the Excise; and Mr. Leyton, solicitor, for the defendant.—The case was remanded by Mr. De Rutzen from the previous week, when it was given in evidence that the chain was over 2 ounces in weight, but it was argued on the other hand that deducting the alloy the gold was under that weight.—In answer to a question by the magistrate, it was admitted that the gold in the chain in question when severed from the alloy, would contain less than 2 ounces of pure gold.—Mr. Leyton said there was a precisely similar case heard at Worship Street in the previous week, and dismissed.—Mr. De Rutzen read

the Act of Parliament bearing on the matter, and said it appeared to him to be perfectly plain that the Act meant the gold, and not the weight of the article.—He dismissed the summons.

THE BRYANT TESTIMONIAL.

THE accompanying illustration represents the testimonial vase presented to the American poet, William Cullen Bryant, Esq., on the eightieth anniversary of his birthday. The vase was presented to him on that occasion, but after his death to be placed in the Metropolitan Museum of Art of New York. We are indebted to the courtesy of Messrs. Tiffany & Co., for the illustration and description of this magnificent work of art.

In reference to the recipient of the testimonial, Mr. Bryant was accepted as the greatest American poet. He was also a journalist of great repute and influence, and a noted orator. He was one of the leading philanthropists, and was identified with the literature and history of his country. He was at once the interpreter of Nature and the ministrant of Art. Classic in the simplicity of his thought and diction, he was thoroughly a modern in his appreciations and sympathies; his translations of Homer, the finest the world has produced, linked the early age to our latter days. What richness of possibility thus opened to the designer in the choice of thought and the design of emblems! His life and his poems were so full of opportunities that the main difficulty was an *embarras de richesse*.

Five designs were submitted to the gentlemen having the control in the matter.

The accepted vase after the Tiffany design, is of Greek form, with open top, the body being the shape of an egg, and is thirty inches in height. It is to be executed in oxydized silver. The chief feature of this vase is the simplicity of its general design. Most of the decoration is in sufficiently low relief to preserve unity of outline, and this effect is perhaps the best point in the successful design. The patterns designed, entirely cover the surface of the vase, and, setting aside the question of artist inspiration, are the work of a thoroughly skilled designer.

The zone of the vase is occupied by a belt of six medallions, the front one being an admirable portrait of Mr. Bryant's noble head, crowned by the classic wreath. Above this medallion is the lyre of the poet, below the primitive printing press, recalling his journalistic career. The other medallions follow the story of his life, with scenes wrought in low relief. An oval medallion on the neck of the vase shows "The Fringed Gentian:"—and the band running around from this bears as legend the most famous and most inspiring lines Mr. Bryant has written:

"Truth crushed to earth shall rise again;
The eternal years of God are hers,"

The handles display a happy adaptation, in full open work, of the Indian corn plant, and are ornamented on the outside with the bursting bolls of cotton.

This use of plants is a salient feature of the design. On the base of the neck is a formalized pattern of the primrose and the ivy leaf, symbolizing youth and old age,—the poet's eternal youth amid snow-crowned years—which admirably replaces the Greek egg-and-dart design. The body of the vase is covered by a formal fret-work, among which the apple-blossoms, typical of fruitfulness, peep out, the eglantine and the amaranth, signifying poetry and immortality, being interwoven with them. The maize and cotton plants are again used on the lower part of the body, these being peculiarly American products; and at the foot of the vase is the leaf of the water-lily, which is symbolical of eloquence.

As originally designed this vase stood upon feet, which made it appear of the common-place presentation sort, and were quite incongruous with its general purpose. It seems to have occasioned some dissatisfaction among the other competitors that this design was permitted to be modified and improved from suggestions found in the competing vases. It has now, in place of the feet, a monumental pedestal, which admirably supports the design of the vase, and is simply adorned with a device of the lyre, cross pens, and broken shackles, the last of course suggesting Mr. Bryant's part in the anti-slavery reform.

The vase was manufactured by Messrs. Tiffany & Co., which fact alone speaks as a guarantee of its high excellence and artistic qualities. It was, we believe, exhibited at the Centennial Exhibition, and will for ever remain as a tribute of gratitude from the citizens of New York, in their Metropolitan Museum.



THE BRYANT TESTIMONIAL VASE.

A SERIES OF PRACTICAL LETTERS ON EXISTING ILLS IN THE WATCH TRADE.

(Continued from p. 181.)

NO. 2.—ON COMPETITION.

(Chiefly extracted from the German of Seb. Geist.)

COMPETITION, as it exists at present amongst us, is well worthy of consideration. Every one takes a different view of the subject, and many who appear to laugh at it are inwardly weighed down by the continual thought of the ever-increasing Hydra. In the moral and better sense of the word competition is a strong incentive to activity and superior workmanship. We often hear the proverb, "AMONG THE BLIND THE ONE-EYED IS KING," and where there is no competition the most worthless piece of workmanship must suffice. Very different, however, is the result of *real* competition. In this case the balance is turned either by the better work or cheaper price. The greater the competition, the better is likely to be the workmanship. This is the general interpretation of the word competition. But in practice something very different is understood; wherever the quantity of stock in the window is largest there people go to purchase, imagining they there have the greatest choice, and thinking (though erroneously) that the larger the stock the cheaper the goods. But in very few instances are purchasers able to find out whether the goods there are *really* better or cheaper, and *this* is always the turning point of the question. Besides this, the whole custom of having special workmen and shops for certain articles is being discontinued, and persons like to "try" at different places. Publicity, and the immense business carried on at certain houses, tend very much to induce buyers to make their purchases at the newest establishments, and thus that modern idol, termed by the French "*Réclame*," opens his jaws so wide to falsehood and to the distortion of truth, that the wild clamour which we find so often in the papers, and from the pen of those who otherwise are known to be sensible and rational, is sometimes even odious. We read, for instance, in glaring letters, "SELLING OFF UNDER COST PRICE ON ACCOUNT OF EXPIRATION OF LEASE," "On account of removal," or, "Having bought a bankrupt's stock," and so on, with many variations. It is as clear as day that any one wanting to sell GOOD ARTICLES UNDER COST PRICE, need not have recourse to such means, but may find more legitimate ways. Some shop-keepers are not ashamed to have *permanently* placarded "*Last Day of Sale*," and the bait is swallowed by thousands. We see, then, how many things there are which dissolve the *real* basis and the true principles of competition.

When we look with admiration at the elegant shop windows, brilliantly illuminated, filled with quantities of articles, and decorated in so fascinating a manner for the wives, but so dangerous for the *pockets* of the husbands, and when we consider the hundreds of things intended to attract purchasers, but having nothing in common with that which coincides with the true basis of competition, we do not understand how one is connected with the other, for certainly by these means the goods do not become cheaper or better. It therefore is not to be wondered at when a simple, honest man with little money, but more brains and assiduity, shudders involuntarily at the thought of the word competition. The wild chase after business in any form is that disastrous competition which shuns no means, no ways, so long as the object is attained, and in such instances there is no room for doubt as to *how* the victory is gained. GET BUSINESS *honestly* if you can, but GET IT is the cry, the instruction to the traveller and to the salesman, and when viewed from *such* aspect, what very unsatisfactory results competition will necessarily produce. Business may often be dull, nevertheless things are seldom so bad but that the honest man can get along in the world, in spite of *reckless* competition, if he but use the necessary amount of patience, perseverance, business tact, and industry. The wise proverb tells us that "An indolent man says there is a lion in the street;" in other language, he lacks the energy which should call him to his duty, and seeks to excuse himself from activity. In like manner, industry is one of the most necessary means of competition. Let business men remember that *they* must seek business or business will seldom seek them. That once sought after, all the energy, perseverance, and industry which they can command must be brought to bear to accomplish the desired object. The most successful men in life have been those who having marked for themselves a certain career, or aimed at the accomplishment of some particular object, have steadily and determinedly persevered therein in spite of all difficulties and obstacles, till light has shone forth from beneath all passing clouds, and a brilliant success has eclipsed all competition. It is particularly in our branches of trade

that such a competitor for merit may find success. Many a golden harvest may be reaped by the honest man, *solely because he can be trusted*. Confidence and trust are the first things to be earned, and form important principles in the watchmakers business. Instead of taking up the fight with still greater vehemence, and overburdening himself with a stock which prevents the steady working business so necessary above all things to the watchmaker, let him pay no heed to those who, in order to obtain low-priced goods, say they can get the same article so much cheaper elsewhere. Much envy arises amongst rival shop-keepers from the deceptive way in which such customers speak. Of course no little firmness is necessary to remain resolute in the whirlwind which peculiar circumstances often raise around. There comes, for instance, a traveller with watches, who tells us fabulous accounts of purchases which our neighbour has made; thinking us credulous and wanting courage, he even exhibits his note-book, but only too often are these memoranda simple tuning forks to induce shopkeepers to purchase. Sometimes we let a customer escape because we cannot come to terms about a trifle, and a few minutes later we see him parading himself with a new chain. This annoys us, and we decide not to let a customer slip through our fingers again without closing a bargain. Later, however, we learn that our envy was groundless, and our loss a gain, for the chain was bought on credit, and never paid for. Were competition followed by the expected results, the public, instead of being imposed upon by bad watches, which are a sham and a delusion, would be benefited by a true, reliable, time-keeper. The hunt for business in any form often brings bad results in its train. That which helps the watchmaker most of all, namely, quiet, regular work, is too often neglected. The large sale of watches, does, it is true, throw off large stocks, nevertheless, profit is often reduced by the high rent, the interest of capital, and the gradually decreasing value of the stock during its display in the shop windows, and lastly, by the guarantee which the watchmaker, more than any one else, has to give.

Competition with upright men, therefore, does not mean worse and cheaper watches, but better workmanship. The true dignity of labour should be recognized now as of old. What in former days was looked upon as honourable is not less honourable in our time. In earlier days work itself was considered honourable, whereas now only riches are the test of respectability, and work is smilingly looked down upon. It is a pity that there are now many watchmakers who are ashamed of the word "work," and call themselves traders in watches. The watchmaking business now-a-days is like many others, neither a manufacturing nor trading business, but a mixture of both. In some houses it is difficult to say whether they manufacture the articles, or merely effect the sale of them, or both, and upon this depends the position of all the watchmakers. The manufacturer who, by means of capital, business capabilities, industry, and organization of labour, furthers his productions, must leave the sale of them to the trader. But should he not also be able to sell his productions retail himself? The trader who undertakes the sale has to employ a large capital, and to bear a heavy risk and heavy costs. Who shall blame him for selling bad articles so long as they are saleable? He sells what is to be sold. The evil consequences are borne by the purchaser who buys the bad article. If the manufacturer, incited by competition, makes cheap, that is, bad watches, he injures his reputation without profiting in the least. Whose fault is it that he produces bad articles, when it is in his power to make better? In the first place he is culpable who hopes to draw more profit out of cheap articles, and the trader, because he buys the goods *in order*, as he says, to be able to compete with others. This is a case where nobody reaps any profit, and least of all the public competition, as it now exists, is nothing else than a whip which ignoble hands hold over those who are weaker in mind and means. But a consolidation of interests of all upright and honest men *must* be upheld, whether recognized or not. The honest mode of doing business, which has a solid foundation, *honours the man and the trade*. This may be considered, in the first place, the basis of action of all educated societies, and generally of every justly thinking man. It is well worthy of consideration how the number of wrong conceptions as to the meaning of the word "COMPETITION" may be lessened, so that it be generally understood only in the *true* sense of the word, for otherwise he is right who compares competition to the well-known fight of the two Kilkenny cats who are said to have eaten each other as far as their tails.

To be continued.

A MAGNIFICENT VASE, 4 feet high, cut from a single piece of agate, has been sent to the Mikado, by the Emperor of Russia.

QUERIES AND REPLIES.

Spring of Clock.—L. O. R. A. asked, through a contemporary, "What is the reason that the spring of a clock seems to exercise the same power whether it is fully wound or nearly down? Also, is it possible to make the tick of an American clock quieter, as it is now very loud?"

The Replies received were as follows:—

From SIRAC, D. J.—When the clockmaker puts the string on the clock, he winds it on the barrel first; then he draws the mainspring up a few notches of the ratchet wheel, so that when the clock is run down the spring in the barrel is partly wound up; but the spring has more power when fully wound up than when run down, but not very much, on account of the spring being wound up in the barrel. This is in reference to the English clock, and in the American the spring is not fully run down when it stops. The loud sound cannot be cured on account of the light pendulum.

From JOHN, Glasgow.—The varying power of the spring of a clock is equalized by a very ingenious and beautiful contrivance called a fusee. The fusee consists of a spiral cone, and acts the part of a variable lever. When the spring is fully wound up it has, of course, the greatest power; but the chain, which connects the barrel and the fusee, is then round the smallest part of the cone, and the lever power is consequently at the least. In proportion as the power of the spring decreases, the lever power of the fusee increases, and thus the gradual loss of power in the one is counterbalanced by the gradual increase of power in the other. The fusee acts the same part to the clock or watch as governors do to the steam-engine.

From T. INGHAM.—In an English clock the power of the spring is equalized by the fusee and gut arrangement. The fusee is a brass cone, around which the gut lies when the clock is wound up. The spring is then acting in the barrel with greater force, which, being transmitted to the fusee by the gut, is pulling at its least diameter. When the clock is nearly down, the spring at its least force is carried to the fusee's greatest diameter, and has most leverage. Hence, you will see the spring's force on the wheel is equal, or nearly so, throughout. American clocks in general have no fusee; the spring is simply fastened to the wheel arbour, and, of course, does not act equally, which causes the clock to vary. The only way, I believe, to deaden the tick is by setting the pallets as close to the wheel as possible. I have heard of bits of fine gut being stretched across the pallets for wheel teeth to drop on, but have never tried it, though, no doubt, it will soften down the tick.

From PITHYXX.—A clock spring does exercise more power when wound up fully than down. "L. O. R. A." is mistaken if he expects to see that power shown in an increased rate of going. If "L. O. R. A." will consider that the spring and wheels of a clock are not in themselves time-keepers, but only subsidiary in maintaining the pendulum, and if he understands the principle of the pendulum, he will see that the only effect an increase of power in the spring can have, is to increase the amplitude, and not the rate of the vibration of the pendulum.

Hair Springs.—HOB asks, through the same journal:—"Will any reader inform me of any plan of selecting a new hair spring for a Geneva watch, to replace a broken one? Also the mode of getting them through the small hole in the brass collet, by which they are pinned to the balance? They have a small portion bent like a hook at the inner end, and I cannot see how this is got through. I have bought a quantity of spring, and want to do my own watch."

The Replies received were as follows:—

By SIRAC, D. J.—First get a piece of cork, and put a piece of small wire through, hooked at the end, then take your old hair spring, and lift it by the outer end with a pair of tweezers, hook the centre to the hook in the wire, and lift the cork up, and see how far it draws the spring down; then get a new spring, and do exactly the same with it, and see that it draws down the same distance as the old one. If it should be a very weak one, get the weakest you have, and dip it in a watch-glass full of aquafortis, then quickly draw it out, and immerse it in ether, to prevent rusting. You will also see a round brass collet, with a hole through the side, and a pin through. Push this pin out, put the hooked end in the centre, and the hair spring in this hole. Then put in the pin; but while you are doing this keep the collet on a piece of pegwood, sharpened to a point. Then put the collet on the cylinder again, in exactly the same place as you took it off. You will notice a pin in the balance wheel. When the hair spring is on, this pin must be exactly in a line with the regulator. When it is in the centre you must fasten the other end of the hair spring to the stud the same way as you fastened it to the collet.

By T. INGHAM.—The manner of selecting a new hair spring is by laying hold of outer coil with fine tweezers, and hooking inner end to cylinder, lift it up. If it makes long spiral it is too weak—if a very short one it is too strong, and it must also be of suitable size, as, when pinned in, to be just free of cock stud. When a suitable one has been selected it is pinned on the collet, and tried in the watch. But, I can assure you, you will find it no easy matter to put a new hair spring on properly. It requires a lot of experience and judgment. Even in the trade it is considered a delicate job, and at many shops workmen are kept at this alone—called springers and timers—therefore I would dissuade you from attempting to spring your watch, as you are sure to fail, and most likely your watch cylinder come to grief.

A Chronometer Watch.—KELBY ASKS:—"Three years ago I purchased a new pocket chronometer from a very respectable watchmaker, in whom

I have every confidence as to integrity, &c., and for which I paid him 30*l*. It has no maker's name on the face, but simply the words 'Chronometer, 2730.' Sometimes it will go for months together, and keep remarkably exact time; and then all at once, without any known cause, will begin to gain or to lose. I am greatly puzzled why this is so. It cannot be that it wants cleaning, for it has been cleaned within twelve months, and after keeping good time for awhile has gained four minutes in about two months, and is gaining now. It cannot arise from a change of temperature, for, in the first place, we have had very little really cold weather this winter, and in the second place I take the greatest care of it, keeping it in my breast watch-pocket all day, and at night, after winding it up, placing it under my pillow. Whatever can be the cause of this variableness of conduct? To me it is quite inexplicable and miraculous. The gentleman from whom I bought it seems also unable to account for it. I see many of your correspondents are well up in this matter—will some one give me a little information or advice?"

The Replies received were as follows:—

By C. STUART MURRAY.—First of all let "Kelby" ascertain whether or not his "chrono" is ever brought within magnetic influence. Should that not be so he may then see whether the person from whom he bought it is a maker or merely a shopkeeper selling watches, for there is a great difference between the two parties. Should the latter suggestion be true, then the best way will be to go to a practical horologist at once—the only real doctor in such a case. Try change of position at night for awhile by laying it quite flat on a piece of felt or thick cloth upon the dressing-table, so that the friction shall come on the ends of the pivots instead of the cylindric surfaces as when in the pocket. Under the pillow is an uneasy place in general for a watch, as it requires rest from the labours of the day, much like human mechanism. Some friends of mine have adopted my suggestions in this way with much advantage.

By SIRAC, D. J.—If "Kelby" keeps his watch lying in one position he will find that it will go exactly right, but if he carries it about it will not, because chronometers are made to go in one position. I think it would be better if he got it exchanged for a lever watch, as they are much better for carrying about. I may also refer to a duplex watch which has the same fault. What causes it to stop is the sudden jerk when moving about, and it will then go again. I think the only way to do will be to get it exchanged.

By T. INGHAM.—Perhaps the cause of gaining is imperfect compensation, or balance slightly out of poise, or from thickening of the oil. I also advise that watches be kept in one position as much as possible. Hang it up at nights. Even ship chronometers, which are made as perfect as possible, are hung on pivots in the chronometer box, so that whatever motion the ship makes, the chronometer remains in exactly one position. Try your watch for a week, hanging it up, then try laying it down. If it varies in the two positions the fault is in the poising of the balance. If it keeps the same time in both positions, try it in a much warmer place; if it still keeps the same time, then the compensation is perfect—if not, it is imperfect, and requires adjusting. Certainly we have not had much cold weather, yet it has been sufficient to cause the error complained of, unless the compensation was very accurate. I knew a gentleman who had a chronometer which cost fifty guineas, and gained fourteen seconds a week, and he was perfectly satisfied with it. I don't believe watches can ever be made to keep accurate time. There are several causes which cannot be got over, such as thickening of oil, agitation during wear, density of air, &c.

By N. N.—"The oil, sir! the oil, sir! you know after a time gets a little stiff, and affects the motion." This is the reply which I mostly get from my watchmaker when I complain of any little irregularity in my watch that cannot be otherwise easily accounted for. This said oil has much to answer for, as it would seem to be the scapegoat for many of the ills that watches are heir to. Can it be this naughty oil that is affecting "Kelby's" watch? I happen to have a brother of his watch in my pocket at this moment, and, I suspect made by the same makers, and if not a twin, very near the same age, as the numbers on the faces vary only three, cost same price, same inscription on face, compensating balance, which I suppose his has also, I treat it just the same—breast pocket by day, and under my pillow at night, bought also of a very respectable watch dealer, not maker, but I happen to know who are the makers, and I have a notion "Kelby" has a shrewd guess also, as the signature he adopts is "very hot" on the name of one of the firm, and would be still hotter had he substituted another letter for the "b," in it. I have not much to complain of in my said watch as to its keeping good time when once I get it properly regulated; but that is my difficulty, and it is on that point I wish to say a few words. I find it so sensitive that if it be gaining or losing a minute or so a week, if I move the regulator the least possible to be perceptible, and that with the aid of a powerful glass, it is too much, and I have often been surprised that no more certain and scientific mode of moving the regulator has been invented than the clumsy uncertain way of pushing it along with a point of some kind. Are there none of our watchmaking correspondents that can invent some appliance for this purpose, and that could also be adapted to watches already made? Could not some screw arrangement be fixed in the making at all events—say a couple of small screws fixed with their points facing each other, between which the end of the regulator lever should be grasped and held tight, so that by giving one screw, a half turn, or less backward, and the other the same forward, you might adjust it with certainty to the greatest nicety, and know that it has moved, though you could not see it? The lever working in a worm would be simpler, but there is the curve against that, besides some unavoidable "play." How are ship's chronometers regulated to such niceties?

MIRROR OF THE MONTH.

MARCH.

MARCH is the first month of spring. Nature is awakening again from its slumbers, and tries to escape from the cold arms of winter. But it is often a severe struggle, and our forefathers very properly called this month "Mareh, many weathers," and said that, "it came in like a lion, and went out like a lamb," for it is made up of sunshine and cloud, shower and storm. We derive the present name of this month from the Romans, among whom it was at an early period the first month of the year, as it continued to be in several countries to a comparatively late period, the legal year beginning even in England on the 25th of March, till the change of the style in 1752. For commencing the year with this month there seems a sufficient reason in the fact of its being the first season, after "the dead" of the year, in which decided symptoms of a renewal of growth take place. And for the Romans to dedicate their first month to Mars, and call it "Martius" seems equally natural, considering the importance they attached to war, and the use they made of it. Among our Saxon forefathers, the month took the name of "Lenet-monat"—that is length month—in reference to the lengthening of the days at this season—the origin also of the term Lent.

March is represented as a man of a tawny colour, and fierce aspect, with a helmet on his head—so far typical of Mars—while, appropriate to the season, he is represented leaning on a spade, holding almond blossoms and seions in his left hand, with a basket of seeds on his arm, and in his right hand the sign Aries, or the Ram, which the sun enters on the 20th of this month, thereby denoting the augmented power of the sun's rays, which in ancient hieroglyphics were expressed by the horns of animals.

March is noted as a dry month. Its dust is looked for, and becomes a subject of congratulation, on account of the importance of dry weather at this time, for sowing and planting. The idea has been embodied in proverb, as "A peck of March dust is worth a king's ransom." Blustering winds generally prevail during the first part of the month.

It was in this month (1781) that Herschel discovered the new planet called Uranus, and that astronomy lost one of its most able and devoted labourers (1859) in the person of Manuel Johnson, of Oxford, better known under the name of, "the Radcliffe Observer."

CHRONOMETERS.

PRIZES have at various times been offered by different countries for the best mode of ascertaining the position of a ship at sea. A treatise is about to appear in Paris which claims to have solved the problem. The authors are M. Yvon Villareean and Lieutenant de Magnac, and their system of navigation is based on the employment of chronometers. It results from the application of the method of equations of condition, which implies the theory of errors of observation derived from the theory of probabilities. Its advantages are that it utilizes the estimated latitude and longitude furnished by the log and compass, and, what is far more important, that the theory of errors of observation allows the ascertaining within a few miles, of the position of ships, by night observations with a bad horizon; in other words, under circumstances in which the old methods were useless. M. de Magnac has succeeded after 100 days' voyage, in sighting land within two miles of the desired point, whereas the old methods, it is asserted, left errors amounting to 15 miles. While a pupil at the Naval School, he was struck by the insufficiency of astronomical navigation as then and still taught, and, on becoming a Naval officer, experience confirmed him in his opinion. He first devoted himself to perfecting the employment of chronometers, and found that the mathematical instruction he had received did not enable him to approach such complex and delicate problems and formulate mathematically the appreciable variations due to the action of physical causes on chronometers. He accordingly addressed himself to M. Villareean, Chief Astronomer at the Paris Observatory, who had previously published a treatise on the mechanical means of neutralizing the action of temperature on these instruments, but who, foreseeing the difficulty of these theories being applied by imperfectly-instructed makers, had offered seamen a formula for representing the influences of temperature and weather on chronometers. M. de Magnac tested this formula of directions for six years on seventeen chronometers, half that time on a sea-going training-ship, and found it most satisfactory. In the forthcoming work, to be published by M. Villars, M. Villareean deals with the theoretical, and M. de Magnac deals with the practical department.—*The Times*.

PRACTICAL INFORMATION FOR THE TRADE.

TO DESTROY THE EFFECTS OF ACID ON CLOTHES.—Dampen as soon as possible after exposure to the acid, with spirits ammonia. It will destroy the effect immediately.

A BRIGHT GOLD TINGE may be given to silver, by steeping, for a suitable length of time, in a weak solution of sulphuric acid and water strongly impregnated with iron rust.

TO PART LEAD FROM GOLD.—As lead melts at 617 degrees Fahr., and gold at 2000 degrees Fahr., melting the lead and removing the gold would be the simplest method for you to adopt in separating the two metals.

POLISHING TORTOISESHELL AND IVORY.—Putty powder (oxide of tin) will put a beautiful polish on ivory, and would possibly do for tortoiseshell. Apply the putty powder on a piece of flannel with water or methylated spirits and elbow grease, and finish off with dry powder.

HOW TO DRY A SPIRAL.—Crush a piece of very hard bread to a fine powder, gather it in a box and put the spiral into it immediately after taking it from the water or alcohol. Shake the box so as to cover the spiral well with the powder, and in a minute or two it can be taken out perfectly clean. By this method the spiral is not liable to injury, as it is by drying between linen or with a brush.—(*Revue Chronometrique*)

TO MAKE A CLOCK STRIKE CORRECTLY.—If not very cautious in pulling up your clock you will get some of the striking train wheels in wrong, and thus produce a derangement in the striking side; slip the pivots of the upper wheels out, and having disconnected them from the train turn the parts around and put them back. If still not right repeat the experiment. A few efforts at most will get them to working properly. The sound in cuckoo clocks is caused by a wire acting on a small bellows, which is connected with two small pipes like organ pipes.

As **NICKELIZING** is replacing silvering in certain cases, so there are cases where nickelizing may be itself replaced for many articles of small value. The manipulation is very simple. Coarse, rasped, or granulated zinc, is boiled for some time in a mixture of three parts, by weight, of sal ammoniac and ten of water. The object immersed and stirred up with a zinc rod. The deposit is silvery bright, and resists mechanical action as well as a coating of nickel. This process can be recommended for goods that are meant for a second coating of some other metal, since any other is easily deposited upon zinc.

THE MERCURIAL PENDULUM.—In a work on watchmaking, says the *Revue Chronometrique*, we find the following words on the above subject. "Take note if the compensation is too weak or too strong; in the former it would be requisite to pour a little mercury in the vase, and in the latter case to diminish the quantity." This is perfectly correct, but in doing so without reflecting, the operator is liable to fall into an error. Supposing a timepiece is well-regulated in a moderate temperature, and that it loses in the cold, a young workman might think that the compensation was too strong, and that it was necessary to reduce the quantity of mercury. If, on the other hand it gained, he would conclude that the compensation was too weak, and add some. In both instances he should act quite the reverse. If the column of mercury is too short, its centre gravity, already too low, will descend still more through the cold, and the movement be still further retarded. If there is too much mercury its centre of gravity will not descend low enough, and the timepiece will continue to gain. It is obvious from the same argument, that in heat too much mercury will cause the timepiece to gain, while if the quantity is insufficient, it will lose. Therefore in the heat and the cold an excess causes it to gain, and an insufficiency to lose.

WE understand that the following firms and institutions have sent in requisitions to be placed on the wires of Messrs. Barraud and Lunds new system of synchronizing clocks. The Bank of England; most of the Lombard Street Bankers and Clearing Houses; Lloyds; Stock Exchange; The Mansion House, (Justice Room); The Eastern Extension Telegraph Company; The Shipmasters' Association; Messrs. Dalgety & Ducroz; Messrs. Morton & Company, and many other private firms. Applications for it has been received from many others, and they will be attended to as rapidly as possible, the continued prevalence of high winds and bad weather greatly retarding the operations of the General Post Office in erecting their wires for the use of Messrs Barraud & Lunds' system.

CORRESPONDENCE.

GREENWICH TIME.

To the Editor of the WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—On p. 205 of your issue of February 5, you repeat from the *Times* of the 24th ult., a statement that with regard to the electric controlled clocks now going in Edinburgh, they have the defect, that “any injury to the line wire stops every clock in connection with it.”

I beg to say that this is a serious mistake; for the clocks are mainly on the principle of Mr. R. L. Jones, late of Chester, complete going clocks in themselves; and even if the line wire should be entirely removed the clocks are *not* stopped thereby; they continue going, but simply as ordinary clocks without electric control.

I beg to call your attention also to my name being twice mis-spelt in the course of your article,

I remain, your obedient servant,

PIAZZI SMYTH, *Astronomer Royal for Scotland.*

Royal Observatory, Edinburgh,

February 7th, 1877.

NOTICE.—“Ramsgate.”—Our esteemed correspondent will find his subject dwelt upon in our leading article.

THE SETH THOMAS CLOCK COMPANY.

THE above Company recently manufactured for Mr. Henry Seybert, of Philadelphia, a very large clock which he presented to the city for the steeple of Independence Hall. It strikes the hour upon a bell weighing 13,000 lbs. They also made a clock which was duplicate of this, except it was arranged to strike the quarters as well as the hours. This clock was placed over the main entrance to Machinery Hall at the late Exhibition. The Independence Hall clock is running very accurately, and Mr. Seybert and his friends are much pleased with it. Its fellow, above-named, is for sale. It is the product of the thought, time, and skill of some of the very best workmen. For this clock and others the Company received from the International Exhibition at Philadelphia the following award:

“For a large tower clock with Denison’s double three-legged gravity escapement. The pendulum has a zinc and steel compensation. The weight of the pendulum ball is 500 lbs., of the rod 200 lbs. There is provision against accident from the breaking of the pendulum springs. The driving weight of this clock is 200 lbs. The whole construction of the train is good, and the action of the escapement is all that can be desired, since an increase in the power applied to the train does not appear to disturb sensibly the arc of vibration of the pendulum.

“Also, for the manufacture of brass clocks in great variety for general use, and of good quality in relation to their prices, and for ornamental clocks.”

This Company manufactures clocks of various prices for household and office use, which are well made and of good materials. Every clock is tested before it leaves the factory. They run well, wear well, and are good time-keepers.

In their advertisement the Company says “If you keep them wound up, we are willing our rivals should run them down.”

USEFUL INFORMATION FOR THE TRADE.

THE FAC SIMILE PRINTING PROCESS. BYFORD’S PATENT.

BY this ingenious invention a number of *fac simile* copies of a new design, sketch, or calculation, &c., may be easily printed in an ordinary copying press, the original drawing or tracing remaining intact. It appears calculated to supply a want long felt in the trade we represent, of a rapid, economical, and we may add confidential method of producing copies of new designs, &c., without the intervention of the printer. We have tried the process, and consider it simple, practical, useful, and reliable, and will have much pleasure in affording any information in reference thereto.

PARIS CHRONOMETER COMPETITION, 1876.—The first prize, 1,200 francs has been awarded to M. T. Leroy. This is the sixth time that he has carried off the first award of that amount, and since 1862 he has furnished the government with no less than sixteen Prize Chronometers.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 202.)

IN the burlesque opera of “Bombastes Furioso,” by Rhodes, first performed in 1810, the great general Bombastes tells the king—

“Thrashed are your foes—this watch and silken string,
Worn by their chief, I as a trophy bring.
I knock’d him down, then snatch’d it from his fob!
‘Watch! watch!’ he cried, when I had done the job;
‘My watch is gone!’ says he; says I, ‘Just so;
‘Stop where you are—watches were made to go.’”

The Norwegian peasants are remarkable for ingenuity, industry, and mechanical genius. T. B. Depping, writing in 1817, says, “A lady of the Danish court one day showed me in a company where we met, a beautiful repeater which she wore. Everybody admired the workmanship, though it was observed not to be so highly finished as the best performances of the watchmakers of London and Paris; but we were not a little surprised when she informed us that this watch was made by a young Norwegian who had never learned the trade, or been from home: that before he could set about this arduous task he had been obliged to make with his rude implements such fine tools as he wanted; and that in three years he had at length completed this beautiful piece of work, which for solidity and regularity was not surpassed by any other of the kind.”

According to the *Gentleman’s Magazine* for 1820, an artist at Cemberg, in Prussia, about that year constructed a talking watch, which imitated the human voice, and answered questions in German and Polish, besides executing musical airs.

The “Annual Register” for 1821 tells us that M. Kuhaiewsky, of Warsaw, had then lately produced as his invention an astronomical watch, which indicated the difference of time in the principal places in various parts of the globe. It had been accepted as a present by the Emperor Alexander, who had sent M. Kuhaiewsky in return a magnificent snuff-box, and assigned him a sum to enable him to continue his important scientific labours.

About the middle of Denzil Street, on the south side, lived in 1829, Theophilus Holdred, a jobbing watchmaker, whose name will always hold a place in one department of mathematical history. He discovered a method of approximating to the roots of numerical equations of considerable ingenuity. Further particulars of him will be found in “Notes and Queries” for 1850.

Brequet was a celebrated French watchmaker, who flourished at the end of the last and the commencement of the present century. He was greatly encouraged by the Allies in 1815. The Emperor Alexander purchased several of his unequalled watches, and the Duke of Wellington had one of them, which, on touching a spring at any time struck the hour and minute. It cost him 300 guineas; he carried it for many years, and it proved of great service to him on many occasions. The Duke and Duchess of Berri, the Marquis of Londonderry, Lords Beauchamps, Chesterfield, Bruce, and many others, were also customers of Brequet, who was without doubt the best and most scientific watchmaker of his age. He was not an advocate for flat watches, as he said they impeded the proper action of the wheels, and could not be depended upon as time keepers. The prices that he paid to his best workmen were enormous, there being few to whom he could entrust his watches, as so many were drunkards, and could work only a day or two in the week. Captain Gronow, in his “Recollections,” says that Brequet told him that he paid some of his artificers thirty francs a day, and none less than a napoleon, and that through Paris there were only fifteen or twenty able to execute the delicate work necessary for such watches as he made. He was a great encourager of merit, and used to say to his young workmen, “Do not be discouraged, or allow a failure to dishearten you.” Brequet, besides his scientific knowledge and mechanical skill, possessed much general information. Napoleon himself, knowing his abilities, frequently went incognito to his workshop, and conversed upon the improvements he was anxious to effect in cannons and firearms.

Napoleon I. had a watch which wound itself up by means of a weighted lever, which at every step that he made rose and fell; and having a gathering click to it, wound up a ratchet attached to the barrel if it were then fully wound up. The instrument called the pedometer, which is not larger than a common watch, is one of the same principle; its use being to register the number of steps taken by the wearer while the instrument is in his pocket. It is capable of adjustment according to the number of steps the wearer usually takes in a mile, which he must first count, and set the instrument accordingly. Without such adjustment it does not form any measure of distance.

(To be continued.)

THE Watchmaker, Jeweller, and Silversmith,

A MONTHLY TRADE JOURNAL,

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Cheques and Post-office Orders to be made payable to A. VICTOR, at Lombard Street Post Office.

SPECIAL NOTICES.

IN order to meet the requirements of the steadily increasing business of this Journal, the offices thereof, will, on and after the 10th inst., be removed to more eligible premises in MILNERS' BUILDINGS, MOORGATE STREET (opposite Moorgate Street Station.)

We must thank our patrons and the trade in general for the encouraging patronage hitherto received, and which has necessitated this removal, and hope to be favoured with a continuation of support in our new offices, where every exertion will be made by us to merit the confidence and promote the interests of the various trades represented by our paper.

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CLOCKS, WATCHES, AND BELLS.

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MONTHLY RECORD OF BANKRUPTCIES.

Liquidations by Arrangement or Composition.

MAXWELL, ALBERT, Salisbury, watchmaker, &c., Feb. 2. G. Nodder, sol. Salisbury.
MORRELL, GEORGE, Park Road, Soho, near Birmingham, jeweller. Jan. 20. C. Davies, sol., 25, Bennett's Hill, Birmingham.
SUSMAN, JACOB, Fish Street, Hull, travelling jeweller and draper. Jan. 5. F. Summers, sol., Hull.
YEOMANS & Co., jewellers. Feb. 5. Saunders & Bradbury, sols., Temple Row, Birmingham.
CARPENTER, JOSEPH LANT, 43, Temple Street, Birmingham, web and brace manufacturer and jeweller. Feb. 5. Saunders and Bradbury, sols., Birmingham.
DIAPER, OLIVER CROMWELL, & PICKFORD, FRANCIS PALMER, dealers in jewellery. Feb. 6. J. P. Moss, sol., 38, Gracechurch Street, London.
DIAPER, OLIVER CROMWELL, Tunbridge Wells, dealer in jewellery (sep. crdrs.) Feb. 6. J. T. Moss, sol., 38, Gracechurch Street, London.
GOODE, JOHN SAMUEL, Hartington Buildings, Birmingham, Jeweller. Feb. 8. R. J. Parr, sol., 27, Colmore Row, Birmingham.
PICKFORD, FRANCIS PALMER, Tunbridge Wells, dealer in Jewellery, &c. Feb. 6. J. T. Moss, sol., 38, Gracechurch Street, London.
YEOMANS, HENRY, 43, Temple Street, Birmingham, jeweller. Feb. 5. Saunders & Bradbury, sols., Birmingham.
BALL, GEORGE JAMES, trading as BRUGGER & STRAUB, 79, High Holborn, and 200, Brixton Road, late Rosemary Road, Peckham, jeweller. Feb. 7. G. H. Finch, sol., Bridge Chambers, Borough.
CLARK, JOSEPH, 70, Hatton Garden and 7, Cross Street, Hatton Garden, late 65, Canonbury Road, Islington, dealer in precious stones. Feb. 15. Browne Kidder and Son, sols., 19, John Street, Bedford Row.
ISAACS, COLMAN, 6, Pontmorlais, Merthyr Tydvil, jeweller. Feb. 12. Simons & Plews, sols., Merthyr Tydvil.
BROWN, WILLIAM, Kirkgate, Bradford, jeweller. Feb. 21. Atkinson, sol. Bradford. March, 12 at 4.
CHIPPING, EDWARD FREDERICK, 1, Edmond's Place, City Road, London, late King Street, Brighton, watchmaker. Feb. 20. T. Sampson, sol., 252, Marylebone Road. March 12 at 10.
LEVIN, LEWIS, 2, Ordnance Row, Portsea, jeweller and watch manufacturer. Feb. 22. G. H. King's, sol., Portsea. March 9 at 4.

Dissolutions of Partnership.

BRADLEY & MOTT, 36, Vyse Street, Birmingham, jewellery factors. Jan. 24. Debts by Samuel Bradley.
CARTWRIGHT & Co., 32, Harford Street, Birmingham, jewellers. Jan. 26.
KEYZOR & BENDON, 50, High Holborn, opticians. Dec. 24. Debts by George Bendon.
MARX, W. & A., East Street, Brighton, jewellers. Dec. 28. Debts by Wolf Marx.
MILLAR & COLLINS, 3, Tarlton Street, Liverpool, working jewellers. Dec. 2. Debts by R. Collins.
PERRY & CURRY, 1, Upper Gloucester Street, Clerkenwell, silversmiths. Sept. 30, 1875.
MORTON, BURKINSIAW, & GREEN, Bridge Street, Sheffield, silver and electroplate manufacturers. Jan 12.
CROUCH, W. & Sons, 32, North Bridge, Edinburgh, jewellers, &c. Feb. 1. Debts by David H. Crouch.

Adjudication of Bankruptcy.

FRAZER, JOHN, 73, Donegal Street, Belfast, jeweller.

Dividends.

KELLER, PHILIP, and EMIL HAHN (Bkts.), Hatton Garden, London, and Birmingham, dealers in precious stones. 1st div. 2s; J. Seear, 105, Cheapside.
DOVEY, HENRY (Liq.), Brighton, jeweller. Div. 1s 8½d; R. S. Henry, 11, Hatton Garden, London.
BARNARD, ASHER, (Bkt.) Exeter, dealer in jewellery. 2nd div. 1s. 6d. E. Fewings, Queen Street, Exeter.

Discharges Granted and Bankruptcies closed.

HODKINSON, HENRY, LASTER, GEORGE H., & POYNTON, HENRY (Bkts.), Coventry, metal workers. Discharge granted—
KOHLE, WILLIAM, (Bkt.), 63, Southwark Bridge Road, watch manufacturer. Discharge granted Dec. 8.
MAUNDER, AARON, Launceston, Cornwall, watchmaker. (From insufficiency of assets no dividend has been declared). Bankruptcy closed Dec. 30.
PETIT, EDOUARD, 220, Fulham Road, jeweller. (A dividend of 2s. 6d. has been paid). Bankruptcy closed Jan. 30.

Distribution of Assets.

WHARTON, EDWARD, Coventry Road and Charles Street, Birmingham, silver plater, died Sept. 21. Claims to W. S. Allen, 35, Waterloo Street, Birmingham, sol.
LEES, THOMAS, Fleet Street, Bury, jeweller, died Oct. 28, 1853. Claims by Feb. 28, to H. S. Cooper, 94A, King Street, Manchester, sol.

Meetings.

SHIRTCLIFFE, JOHN, jun. (Bkt.) Sheffield, electro plate manufacturer. At County Court, Sheffield, March 8 at 12, exam.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

348. WILLIAM THOMAS KERRY, of 10, Sotheron Road, King's Road, Fulham, in the county of Middlesex, for an invention of "A new or improved polish for cleaning, reviving, and renovating jewellery, plated ware, furniture, and other such like articles."—Dated 26th January, 1877.
369. WILLIAM HARVEY, ERNEST WILLIAM HARVEY, and ALFRED HARVEY, of Azoff Villa, North Woolwich, in the county of Essex, Steel Manufacturers, for an invention of "Improvements in the manufacture of soft steel or ingot iron, and in the application of the same to various useful purposes."—Dated 29th January, 1877.
419. ALFRED VINCENT NEWTON, of the Office for Patents, 66, Chancery Lane, in the county of Middlesex, Mechanical Draughtsman, for an invention of "An improvement in watch movements."—A communication to him from abroad by the Elgin National Watch Company (Incorporated), of the city and state of New York, United States of America.—Dated 31st January, 1877.
442. CHARLES MOREAU, Optician, of the city of Paris, in the republic of France, for an invention of "Improvements in opera, field, and marine glasses."—Dated 2nd February, 1877.
443. ACHILLE FONTAINE, of Paris, (France), Manufacturer, for an invention of "An improvement in fastenings for gloves."—Dated 2nd February, 1877.
456. MAX STRAUSS, of Holborn Viaduct, in the city of London, and JOHN FREDERICK BENNET, of South Hackney, in the county of Middlesex, for an invention of "An improved shirt stud or button applicable for other fastening purposes."—Dated 2nd February, 1877.
496. FRANCIS HERBERT WENIAM, of 8, Oxford Road, Ealing, in the county of Middlesex, Engineer, for an invention of "An improved object-stage for microscopes."—Dated 6th February, 1877.
521. JAMES LEFTWICH WARNER, of 40, Tulse Hill, in the county of Surrey, Gentleman, for an invention of "An improved apparatus, attachment, or fastening for protecting watches, purses, and other similar articles from being stolen from the person."—Dated 7th February, 1877.
530. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an invention of "Improvements relating to the working, regulating, and winding-up of clocks, chiefly designed for controlling a series of clocks by pneumatic power."—A communication to him from abroad by Victor Popp, Ernest Resch, and Charles Albert Mayrhofer, as representatives of the "Gesellschaft zum Betriebe pneumatischer Uhren," of Vienna, Austria.—Dated 7th February, 1877.
557. THOMAS BAKER, of New Street, Sudbury, in the county of Suffolk, Spring Maker, for an invention of "A new and improved apparatus for punching, pressing, or cutting holes or slots in iron, steel, and other metals."—Dated 9th February, 1877.
590. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an invention of "An improved machine for making wire springs."
608. HENRY SCHOOLING, of Southampton Buildings, London, for an invention of "Improvements in apparatus for locking or fastening the doors of safes, strong rooms, and other similar depositories."—Dated 14th February, 1877.
610. THOMAS TONKS, the younger, of Birmingham, in the county of Warwick, Button Manufacturer, for an invention of "An improved link for cuffs, gloves, or other articles of dress."—Dated 14th February, 1877.
617. THOMAS GRAY, of Rokesley House, St. Michael's Road, Stockwell, in the county of Surrey, and JOHN MCPARLANE GRAY, of 127, Queen's Road, Peckham, in the same county, for an invention of "Improvements in optical instruments for viewing coloured signal lights."—Dated 14th February, 1877.
646. CHARLES HASELER, of Aston, near Birmingham, in the county of Warwick, Watch Maker, for an invention of "An improvement or improvements in watches and other time-keepers."—Dated 16th February, 1877.
661. JOHN CHISHOLM, of Edinburgh, in the county of Mid Lothian, North Britain, for an invention of "An improved combined brooch and chatelaine or device for carrying materials used in knitting and other similar work."—Dated 17th February, 1877.
718. HENRY ANGELO LUDOVICO NEGRETTI, and JOSEPH WARREN ZAMBRA, both of Holborn Viaduct, in the city of London, Meteorological Instrument Makers, for an invention of "Improvements in thermometers and hygrometers."—Dated 21st February, 1877.
753. ISAAC GRINDROP, Watch Maker and Jeweller, 33, Toad Lane, Rochdale, in the county of Lancaster, for an invention of "An improved solitaire or sleeve stud or fastening for wearing apparel."—Dated 23rd February, 1877.

Grants of Provisional Protection for Six Months.

88. TO ROBERT MANN LOWNE, of East End, Finchley, in the county of Middlesex, for the invention of "Improvements in barometers."

140. TO JOHN MATTHEW MAY, of Hatton Garden, in the county of Middlesex, Merchant, for the invention of "Improvements connected with the manufacture of clock cases, barometer cases, thermometer cases, and other like cases."
265. TO JOHN HOLLOWAY, of the firm of Holloway Brothers, of 7, Jeffrey's Square, in the city of London, for the invention of "Certain improvements in the production of metals or metallic alloys, and in the process employed therefor."
186. TO JOSEPH HILL, Manufacturer, of Birmingham, in the county of Warwick, for the invention of "Improvements in the manufacture of solitaires."
313. TO SAMUEL VICKERY and JAMES THOMAS WHITE, both of Clerkenwell, in the county of Middlesex, Watchmakers, for the invention of "Improvements in the construction and adjustment of chronometers, watches, clocks, and other time-keepers."
359. TO FREDERICK CADBY, of King's Heath, King's Norton, in the county of Worcester, Manager of Glass Works, for the invention of "Improvements in cruet frames, liquor frames, sugar and cream frames, pickle frames, and breakfast frames."
419. TO ALFRED VINCENT NEWTON, of the Office for Patents, 66, Chancery Lane, in the county of Middlesex, Mechanical Draughtsman, for the invention of "An improvement in watch movements."—A communication to him from abroad by the Elgin National Watch Company (Incorporated), of the city and state of New York, United States of America.
443. TO ACHILLE FONTAINE, of Paris, France, Manufacturer, for the invention of "An improvement in fastenings for gloves."
348. TO WILLIAM THOMAS KERRY, of 10, Sotheron Road, King's Road, Fulham, in the county of Middlesex, for the invention of "A new or improved polish for cleaning, reviving, and renovating jewellery, plated ware, furniture, and other such like articles."
442. TO CHARLES MOREAU, Optician, of the city of Paris, in the republic of France, for the invention of "Improvements in opera, field, and marine glasses."
456. TO MAX STRAUSS, of Holborn Viaduct, in the city of London, and JOHN FREDERICK BENNET, of South Hackney, in the county of Middlesex, for the invention of "An improved shirt stud or button, applicable for other fastening purposes."

Notices to Proceed.

3780. FRANK McCLEAN, of Fernelcliff, Tunbridge Wells, Civil Engineer, has given notice in respect of the invention of "Improvements in spectroscopes, chiefly for use with astronomical telescopes."
88. ROBERT MANN LOWNE, of East End, Finchley, in the county of Middlesex, has given notice in respect of the invention of "Improvements in barometers."
3853. JOHN RICHARDS, of Birmingham, in the county of Warwick, Jeweller, and JAMES TANDY, of Birmingham aforesaid, Jeweller, has given notice in respect of the invention of "Improvements in solitaires, sleeve-links, collar and other studs, fastenings for articles of dress and jewellery, bags, and other articles."
3978. HENRY JULIUS HALLPIKE, of Shepherd's Bush, in the county of Middlesex, has given notice in respect of the invention of "Improvements in sleeve links, collar studs, and other similar articles."
4007. JAMES GRASON, of 4, Fore Street, Tiverton, in the county of Devon, Jeweller, has given notice in respect of the invention of "An improved self-locking shirt stud, applicable also for other fastening purposes."
4037. GEORGE GREEN, of Birmingham, in the county of Warwick, and JAIME MAILLOL, of the same place, have given notice in respect of the invention of "Improvements in mounting electro-plate wares, such as waiters, side-dishes, 'butters,' cake baskets, and other articles of a similar kind."
4251. GEORGE WALKER, of Birmingham, in the county of Warwick, Gilt Toy Manufacturer, has given notice in respect of the invention of "Improvements in the construction of solitaires, shirt studs, and other such like fastenings."
4297. DAVID CUTLER, of Birmingham, in the county of Warwick, Manufacturer, has given notice in respect of the invention of "Improvements in solitaires, sleeve links, shirt, collar, and other studs, and other similar dress fastenings and ornaments."

Patents Sealed.

ERROR.—In the January number of this Journal, under the heading of Patents Sealed, 2797, the name of Ami Louis Junod-Pattus, should read of St. Croix, Switzerland, instead of Paris, France.

3309. CHARLES HARROLD, of Birmingham, in the county of Warwick, Refiner and Metal Roller, for an invention of "Improvements in the manufacture of watch pendants, and in tools or machinery employed in the said manufacture."—Dated 23rd August, 1876.
3366. CHARLES JACKSON, of Burton-on-Trent, in the county of Stafford, Jeweller and Silversmith, for an invention of "Certain improvements in the manufacture of solitaires and studs, glove fasteners, and other like purposes."—Dated 28th August, 1876.
3785. GEORGE EDWARD PRITCHETT, of 39, Lombard Street, in the city of London, Architect, for an invention of "New or improved means,

apparatus, or appliances for utilising clocks, clockwork, or time-keeping movements, so as to put the same in communication with distant buildings, rooms, ships, mines, or places."—Dated 28th September, 1876.

3285. CHARLES AUGUST HERZOG, of 25, Bouverie Street, in the city of London, for an invention of "Improvements in watches."—A communication to him from abroad by Charles Morlet, of Geneva, Switzerland."—Dated 22nd August, 1876.

3436. FREDERICK WEINTRAUD and RICHARD JAMES SECUNDUS JOYCE, of 18, Aldermanbury, in the city of London, Manufacturers, for an invention of "Improvements in solitaires, or sleeve and collar studs."—Dated 31st August, 1876.

457. EMMA ELIZABETH ASHING, of Camden Town, in the county of, Middlesex, for an invention of "Improvements in solitaires and studs and other similar dress fastenings."—Dated 5th September, 1876.

Patents on which the Stamp Duty of £100 has been paid.

338. ISAAC ADAMS, jun. of Boston, in the state of Massachusetts, in the United States of America, but now of 62, Chancery Lane, in the county of Middlesex, for an invention of "Improvements in effecting the electro deposition of nickel."—Dated 2nd February, 1870.

Patent on which the Stamp Duty of £50 has been paid.

563. CHARLES ANDREW TERREY, of St. George's Road, Southwark, in the county of Surrey, Engineer, for an invention of "An improved method of setting diamonds in drills and other boring and cutting tools."—Dated 14th February, 1874.

Patents which have become Void.

183. FREDERIC RÖTIG, of Havre, in the empire of France, Watch and Chronometer Manufacturer, for an invention of "Improvements in the construction of watches."—Dated 21st January, 1870.

333. JOHN STOWELL ADAMS, of the city of Boston, in the state of Massachusetts, in the United States of America, for an invention of "Improvements in kaleidoscopes."—A communication to him from John Collicatt, a person resident at the said Boston.—Dated 26th January, 1874.

1. HIRSCH and WALTER, of Berlin, for "A so-called 'Niroid-barometer,'"—Dated 22nd September, 1875.—Cancelled 2nd December, 1876.

370. LEVI PARSONS MERRIAM, of Leadenhall Street, in the city of London, for an invention of "Improvements in machinery or apparatus for soldering metals."—Dated 29th January, 1874.

419. FREDERICK ARTHUR WALTON, of Birmingham, in the county of Warwick, Manufacturing Jeweller, for an invention of "Improvements in fastenings for wearing apparel."—Dated 2nd February, 1874.

550. THOMAS PERKS the younger, of the firm of Thomas Perks and Sons of Birmingham, in the county of Warwick, Jewellers, for an invention of "Improvements in brooches, shawl pins, nursery pins, and other like fastenings."—Dated 13th February, 1874.

552. JOHN GOATER, of Clarence Cottage, South Street, Ponder's End, in the county of Middlesex, Mechanic, for an invention of "Improvements in arranging and combining the materials used in the manufacture and construction of fire and burglar proof safes, strong boxes, and other receptacles, and the parts connected therewith."—Dated 13th February, 1874.

476. WILLIAM ROBERT LAKE, of the "International Patent Office," Southampton Buildings, London, Consulting Engineer, for an invention of "An improved instrument for determining the altitude and zenith distance of celestial bodies."—A communication to him from abroad by Hall Colby, of the city and state of New York, United States of America.—Dated 17th February, 1870.

Patents Granted in Foreign States.

PRUSSIA.

8. S. SCHUSTER, of Polnitz, Silesia, for "A regulator-clockwork."—3 years.—Dated 7th December, 1876.

32. J. KUNTZ, of Leipsig, for "An instrument for measuring the expansion of gaseous bodies."—3 years.—Dated 24th December, 1876.

GRAND DUCHY OF BADEN.

13. R. E. G. NEUMANN, of Königsberg, for "A contrivance for fire and burglar-proof safes."—3 years.—Dated 14th January, 1876.

33. K. WEGER, of Lichtenau, for "Watches with anchor escapements."—3 years.—Dated 31st March, 1876.

81. A. BERNSTEIN, of Berlin, for "An apparatus for sorting gold coins by weight."—3 years.—Dated 7th July, 1876.

91. A. R. GUILMET and E. JAPY, of Paris, for "Oscillating pendulum clocks with equipoised balances and reaction escapements."—3 years.—Dated 9th August, 1876.

103. L. JÄHLIN, of Säckingen, for "A regulator model clock."—3 years.—Dated 19th August, 1876.

162. K. HACKER, of Pforzheim, a Patent of Prolongation for "A process for the manufacture of flexible gold bands."—3 years.—Dated 23th November, 1876.—(Original Patent, 3rd January, 1874.)

AUSTRIA.

69. A. L. JUNOD-PATTUS, of St. Croix, Switzerland, for "A remontoir watch with a quarter repeating motion without wheels and hammers."—1 year.—(Secret.)—Dated 14th September, 1876.

70. M. KANDEL, of Bottuschan, Roumania, for "A watch with a peculiar handle."—1 year.—(Secret.)—Dated—

FRANCE.

114,820. CHATAIGNEAU, for "Catches for studs of cuffs, clasps of cravats, and other similar articles."—Dated 2nd October, 1876.

114,828. GARAND, Brothers, of Paris, for "A brooch for head-dresses."—Dated 4th October, 1876.

114,837. PETIT-PIERRE and BRUSON, for "A ring-stud for collars and ties."—Dated 3rd October, 1876.

107,021. BEAULAVON, for "An isochronous compensation pendulum for clock-work."—Dated 7th October, 1876.

112,761. MICHAUX, for "A clasp for cravats."—Dated 16th October, 1876.

102,779. THOMAS, for "Improvements in clock-work."—Dated 4th October, 1876.

BELGIUM.

41,201. A. HECQ, of Fontaine-l'Évêque, for "An escapement with ruby pins applicable to clocks and watches in general."—Dated 2nd January, 1877.

41,284. J. BRITTON, for "Improvements in the springs of watch-cases."—Dated 15th January, 1877.

41,297. J. C. W. JEFFERYS, for "Improvements in button-clasps for jewellery, &c."—Dated 16th January, 1877.

41,358. T. ALLEN and T. DAWSON, for "Improvements in clasps for ladies' dresses."—Dated 27th January, 1877.

41,418. F. TIMMERMAN, of Couillet, a Patent of Improvement for "Modifications in his barometer apparatus for regulating ventilators."—Dated 2nd February, 1877.—(Original Patent, 31st March, 1876.)

41,434. F. DESERT, for an imported invention of "An alarm for watches."—Dated 5th February, 1877.—(French Patent, 11th April, 1873.)

UNITED STATES.

6275. ADAM CHAMBERS, of Pueblo Col., U.S., for "Improvements on odometers." (Perfectionnements aux odomètres.)—5 years.—Dated 10th July, 1876.

CANADA.

6429. WILLIAM ELSELE, of Indianapolis, Ind., U.S., for "Improvements in finger rings." (Perfectionnements des anneaux de doigts.)—10 years.—Dated 12th August, 1876.

6432. FREDERICK H. VOIGHT, of Buffalo, N.Y., U.S., "Improvements on chronometer escapements." (Perfectionnements aux échappements d'horlogerie.)—5 years.—Dated 12th August, 1876.

6435. JOHN P. KISLINGBURY, of Rochester, N.Y., U.S., for Door bolt and burglar alarm." (Verrou de porte alarme-voleur.)—5 years.—Dated 12th August, 1876.

BAVARIA.

91. T. COMTE and E. DE BARY, of Munich, for "An alloy for the manufacture of gold and silver wire, and also of gold and silver thread."—5 years.—Dated 8th June, 1876.

114. C. HERMANN, of Nuremberg, for "Improvements in the construction of fire and burglar-proof safes."—3 years.—Dated 17th July, 1876.

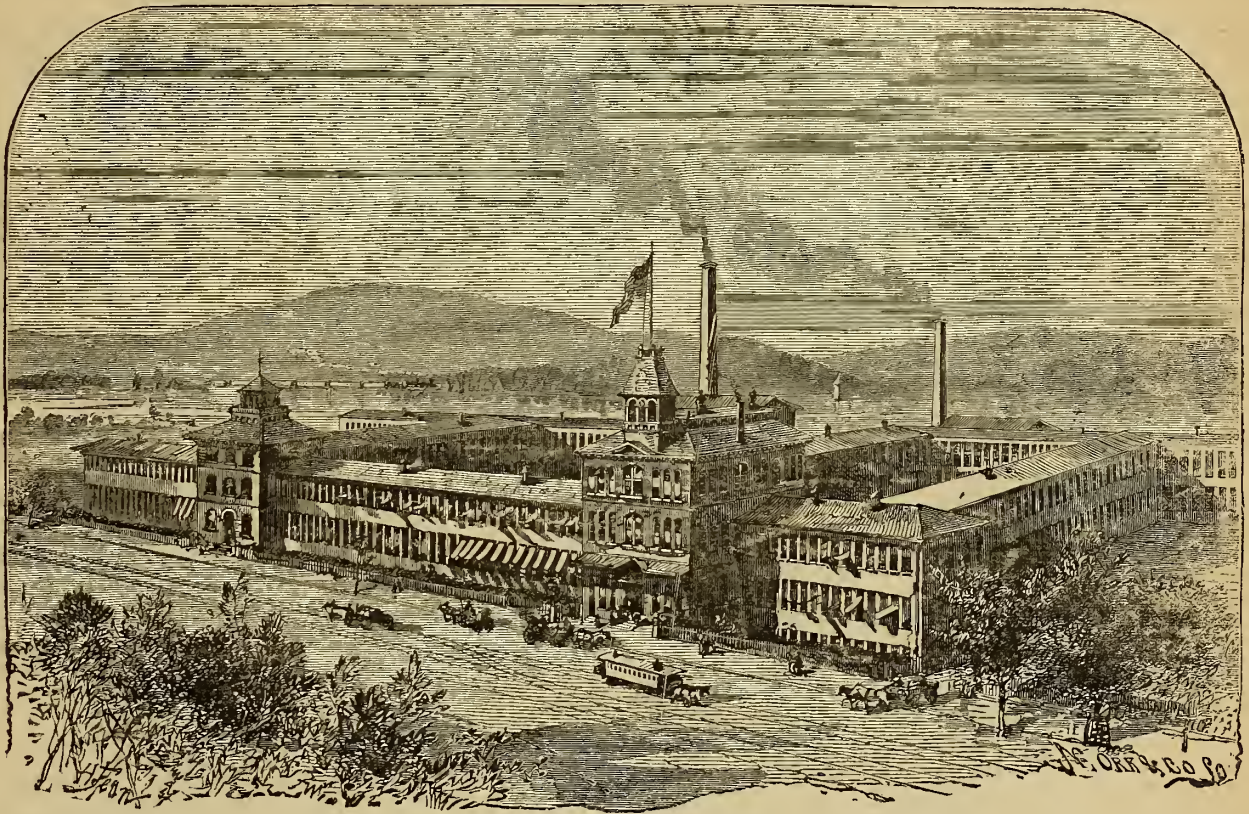
143. C. WEGER, of Lichtenau, Baden, for "A construction of watches."—3 years.—Dated 7th September, 1876.

Designs Patented in the United States.

9342. JOSEPH I. KNIGHT, of Philadelphia, Pa., for an "Ear-ring."—Application filed 22nd May, 1876.—Term of patent 3½ years.

PRIZES FOR DESIGNS FOR A DESSERT SERVICE OF PLATE.—Four prizes of 100*l.*, 50*l.*, 30*l.*, and 20*l.* respectively, are offered through the Science and Art Department, by Messrs. Watherston and son, for the four best designs for a dessert service of plate, comprising a central plateau, four candelabra, four fruit dishes, four flower stands, and four salt cellars. The service, when manufactured, is to be of a total weight of 2,000 ounces of silver. The competition is limited to candidates—British born—who are, or have been, *bonâ fide* students of Schools of Art recognised by the Science and Art Department, and who have since 1867 taken a third grand prize, or a higher prize in the National Competition of that Department. The drawings and models of all competitors must be forwarded to the Department through the Secretaries of the Schools of Art in which they are or have been students. The designs must bear a distinguishing motto, which with the competitor's name and address must be sent to the Department in a sealed envelope with the designs, on or before the 15th of March, 1877. The awards will be made by the Director for Art, E. J. Poynter, R.A.—*Journal Society of Arts.*

"By hand-labour it is impossible for this country to compete with Switzerland in the Watch Trade; and, if we would hold our own in Europe in this branch of industry, we must follow the example of the Americans, who have successfully used machinery in the manufacture of Watches."—*Extract from the "Times" of December 18, 1868.*



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WIEGEL, B., Jnn., Diamond Merchant and Jeweller, 27, Wilmslow Square, Clerkenwell. Diamonds and precious stones mounted or reset to the best advantage. Country Orders punctually attended to.

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STRAM, ALFRED, 12, Ashby Street, London, E.C.

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A MONTHLY TRADE JOURNAL,

Devoted to the Interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades.

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PRESENT STATE OF THE JEWELLERY TRADE.

THE Jewellery Trade in its numerous branches, like many other trades has had its ups and downs; and is not now as it once was. It has passed through and indeed is still undergoing a remarkable change, one which has, and is affecting the manufacturer and factor alike. Men of the old school are beginning to wake up to a painful sense of the altered condition of things, and to realize the stubborn fact, that fortunes are not easily obtained now-a-days in the jewellery business; and the oft-repeated cry is, what will become of the jewellers?

At the present time the aspects of the jewellery trade generally considered seem dismal and gloomy, and although it is not wise to raise a dismal cry about it, nevertheless it would be unwise and impolitic to say of it that it was other than decidedly bad. It might be said truly of the jewellery trade, that it has gone from bad to worse, and there seem no immediate prospects of any great improvement. Trade and commerce in all its ramifications is clearly bad both home and foreign, and trade universally throughout the world is unsatisfactory if not alarming, the markets all being over stocked. Things in their nature will change and alter, and most if not all will vary from time to time. Whenever however, a revival in trade generally takes place, it is open to grave doubt whether the jewellery business will ever be as good again as in days gone by, unless some great changes take place unlooked for now.

The present age is one of change, all things appear subject to that law, and the jewellery trade certainly has changed vastly of late from that of the so called good old times, when manufacturers were comparatively few, factors few in number, and shippers an inconsiderable part of the jewellery community; at the same time the demand for articles, common, medium, and best, was large, whilst

the credit was short, the profits good; rents were low, and taxes moderate. Besides these advantages, there were many others; designing was not then as it is now a fine art, workmanship was not altogether first-rate, and quantities of goods of the same pattern were manufactured and sold, which of course tended considerably to make the trade lucrative.

Now-a-days things are otherwise, and circumstances very different; wages have risen considerably, working hours (happily) are much shorter, prices of all varieties of goods are considerably lower, while the working expenses have augmented in every department, and the profits all round have been gradually reduced to a disproportionate extent; and in addition to these unwelcome changes, credit has lengthened to an unreasonable and commercially unsound time, competition has increased, while the demand for jewellery has of late years declined in every branch, and appears to be in a very unsatisfactory state. Assuredly therefore the signs of the times so far as concerns the jewellery trade both home and abroad, do not present a bright aspect. Masters and men alike are feeling the depressed state of trade, and it is painful as well as serious to hear the cry outs against it, all sorts of questions are being put, and vaguely answered, many speculations are indulged in idly, and many minds give opinions as to what the probable end will be. One thing is clear, many men are going to the wall, and very few indeed coming to the front. Bad debts have lately been in the ascendant, and good balances conspicuous by their absence; failures have been plentiful, black lists numerous, and private meetings the expected thing; whilst compositions, arrangements, liquidations, and bankruptcies are common enough. Losses, anxieties, fears, and a looking forward to new break ups and tumble downs, are matters which for some time passed have engaged the thoughts of business men, till business has become a bugbear.

Bad times of trade, engender bad traders, and there are a number of mushroom sort of traders which in such periods spring up, with no money, and (if possible) less principle, and these mountebank traders or more correctly speaking speculative rogues, prowl about from place to place, and carry on a system of wholesale slaughter. Goods get into the hands of bad traders, and as a rule the money is not forthcoming. Of course such a state of things produces disastrous results to the honest trader in every conceivable way; for it sends into the market quantities of articles which have found their way there by being sacrificed to an awful extent; the market becomes flooded, and the producers are too frequently ruined.

Again, the jewellery trade has developed enormously, and expanded to a fashion almost beyond reckoning; it has grown quite out of itself, and the results are, that there is a falling off of orders; no one seems to want anything, and instead of orders (properly so called) coming in as a rule, jobs and single articles form the principal trade, and orders become the exception. While questionable traders at home, and black sheep abroad, make things, to use an Americanism, rather shakey.

Unfortunately the jewellery business has of late years become extraordinarily speculative, and consequently notably risky, and this state of things has been fatal to developing the beauty and true art which should characterize the trade. It is patent that an important branch like that of jewellery, and which may fairly be ranked as one of the fine arts, is really gaining no solid and permanent ground, so far as the generality of makers are concerned, for there is scarcely any direct encouragement given to makers to produce first-class articles chaste in design, admirable in execution, and beautiful in finish—buyers ask for goods “at a price”—there seems an universal lack of spirit in the trade, and somehow dealers are only too anxious to send into the market goods seemingly right, but really bad, so far as substance and worth are concerned. Thomas Carlyle said, some time ago, “the characteristic of our day is cheap and nasty,” and he follows up by asking where he could buy a good brick? His words apply with singular force to the jewellery business, for heaps of stuff, called common jewellery, go into endless shops and warehouses and there hang fire, to the detriment of all good trading. Common wares would be more applicable to barrow loads of the so-called jewellery, and such, for the most part, is little less than so much useless lumber, badly designed, badly made and finished, and sold at a price that only naked savages would think of purchasing it. “Light weights” is peculiar to endless quantities of mock jewellery, mere imitation rubbish, the very shadow of the substance of sound goods. An over-production of cheap and common jewellery, which literally over-stock warehouses and shops, flood the markets, and ultimately disgusts all concerned, makers, buyers, and sellers alike, does infinite harm to all legitimate trading in the better class of jewellery. There is now a run on silver goods, and makers are up and doing, and already, go where you will, silver articles are exhibited; but silver will soon have had its day, and the market will be deluged therewith, and gold will hold its own against all else.

What the issue of the present unsound condition of things will be seems obvious enough, a still further change must take place, and the jewellery trade will be more or less revolutionized, and then a more healthy aspect will set in, and probably continue.

The introduction of more stringent laws to protect the trade against men of straw, the common agreement on the part of the manufacturers themselves as to something like a sound and sensible limitation of credit, and a wholesome understanding with each other that unsound, untrustworthy, and characterless persons should not, in any instance, be supplied with their goods, would do more to weed out a number of dangerous speculators and improve the trade than aught else. First-class articles and good value for money, should be the principle adhered to.

The old-established factors, who are a credit to themselves and the trade at large, can do a great deal towards altering the present abnormal condition of the trade. If they would support first-class makers more than they have done of late, it would answer their purpose in the long run, for then manufacturers would meet their wants and requirements.

That the jewellery trade needs reforming is self-evident, and the most sensible way of dealing with the question, is for those persons who best understand it in all its varied bearings, to set about some plan which will commend itself to the commercial world, and then there will be found both men and capital to carry out such changes as will make the trade worth being connected with.

MIRROR OF THE MONTH.

APRIL.

IT would take more space than we can afford, to set down the worth of this month, which makes nature into one emerald. It is Heaven's blessing and earth's comfort. It is the messenger of many pleasures, the farmer's profit, the labourer's harvest, and the beggar's pilgrimage. In short, it is the jewel of time and the joy of nature. In the ancient Alban calendar, in which the year was represented as consisting of ten months of irregular length, April stood first, with thirty-six days to its credit. In the calendar of Romulus, it had the second place, and was composed of thirty-six days. Numa's twelve months' calendar assigned it the fourth place, with twenty-nine days; and so it remained till the reformation of the year by Julius Cæsar, when it recovered its former thirty days, which it has since retained. It is commonly supposed that the name was derived from the Latin *aperio* (I open) as marking the time when the buds of the trees and flowers open. If this were the case it would make April singular amongst the months, for none of the other names, as designated in Latin, have any reference to natural conditions or circumstances. There is not the least probability in the idea. April was considered amongst the Romans as Venus month, obviously because of the reproductive power of nature now set agoing in several of her departments. The first day was especially set aside as *Festum Veneris et Fortune Virilis*. The probability, therefore is, that *Aprilis* was *Aphrillis* founded on the Greek name of Venus (*Aphrodite*). Our Anglo-Saxon forefathers called the month *Aster-Monath* (as it is still called by the Germans), and for this appellation the most plausible origin assigned is—that it was the month during which the east winds prevailed. The term Easter may have come from the same origin. It is eminently a spring month, and in England some of the finest weather of the year occasionally prevails in April. Generally, however, it is composed of shower and sunshine rapidly chasing each other, and often a chill is communicated by the east winds. The sun enters Taurus on the 20th of the month, and thus commences the second month past the equinox. At the beginning of April, in London, the sun rises at 5.33 a.m. and sets at 6.27 p.m.; at the end, the times of rising and setting are 4.38 and 7.22.

DESTRUCTION OF THE NEW YORK OFFICES OF THE WALTHAM WATCH COMPANY.

THE New York papers announce that on the evening of the 7th ult., a fire occurred in the well-known “Waltham Building,” situated at Nos. 1, 3, and 5, Bond-street, New York, and which was recognized as the “Uptown” head-quarters of the watch and jewellery trade. Erected in 1871, by Messrs. Robbins and Appleton, this building was occupied by some of the leading firms of the United States, and in the short period of six years became one of the best known buildings in the city, but is to-day, together with several of its adjacent handsome edifices, reduced to a heap of ruins.

The offices of Messrs. Robbins and Appleton, Agents for the American Watch Company, were situated on the second floors of Nos. 3 and 5, and the entire top floor of the building was occupied by them as a gold case factory. Their estimated loss on watches, movements, cases, &c., is 250,000 dols., and on the building, 215,000 dols. The latter is insured for 180,000 dols., and the stock fully covered. They are determined not to offer for sale any movements or materials which have passed through the fire; and have already taken active steps to establish another gold case factory, which will doubtless soon be in working order. At the time of the fire, that department was pushed to its utmost in order to meet the demand. The factory at Waltham is running under full force, endeavouring to fill orders and meet the extra demand which loss of stock has occasioned. The other occupants of the building were: The Gorham Manufacturing Company, Messrs. Hale & Mumford, Taylor and Brother, Carter, Howkins & Sloan, The Adams & Shaw Company, Baldwin, Sexton & Peterson, J. Eugene Robert, T. G. Brown, Jesse S. Cheyney, Dominick & Hafl. The Jewellers' Association, Pearce, Kursh & Co., Jacot Gerard & Co., whose losses (exclusive of those of the last-named firm, not yet ascertained) amount in the aggregate to 635,000 dols., which together with the total losses of Messrs. Robbins and Appleton will figure up to a destruction of property of the value of over a million of dollars.

We understand that the London branch of the Waltham Watch Company fortunately had a large stock here, and that consequently the trade here will not be affected.

PARIS has a public barometer with a dial nearly five feet in diameter

CORRESPONDENCE.

To the Editor of THE WATCHMAKER AND JEWELLER.

Permit us to say that "Kent's Directory," as quoted in your February number, is incorrect, at least as regards ourselves, as we hold at the present moment a small pan case watch, made in 1756, by the original "Barraud," of Wine Office Court, Fleet Street, which, by the way, is still in going order. Would you allow us to add that as we have good reason for believing that we existed some years previously, we shall be glad to purchase or obtain sight of a watch of an older date?

Yours obediently,
BARRAUD & LUNDS.

PRACTICAL INFORMATION FOR THE TRADE.

COBALT PLATING.—The most beautiful cobalt plating may be obtained upon brass and copper, by employing in the battery—with two Bunsen cells—a moderately concentrated solution of the double chloride of ammonium and cobalt. This solution is prepared by dissolving 40 grammes of crystalized chloride of cobalt, and 20 grammes of chloride of ammonium, in 100 cubic centimetres of water, with the addition of 20 cubic centimetres of ammonia.—*Mechanic.*

ARTIFICIAL DIAMONDS.—Many pastes have been devised for the preparation of these beautiful stones. None have been able in their products to equal the natural diamond in hardness and brilliancy; but nevertheless to an unpracticed eye the imitation is so perfect that the difference cannot be distinguished. The following formula for making a diamond paste is said to be one that gives the most satisfactory result. It is called "Loysel's" paste:

Take pure silica ...	...	...	...	100 parts.
Red oxide of lead ...	...	...	...	150 "
Potash, calcined ...	...	...	...	30 "
Borax, calcined ...	...	...	...	10 "
Arsenious acid ...	...	...	...	1 "

This produces a paste which has great brilliancy and refractive and dispersive powers, and also a specific gravity similar to that of the oriental diamond. It fuses at a moderate heat, and acquires the greatest brilliancy when re-melted and kept for two or three days in a fused state, in order to expel the superabundant alkali, and perfect the refining. This paste is used not only to produce factitious diamonds, but, besides, other factitious gems, of which it forms the basis.—*American Journal of Industry.*

ARTIFICIAL IVORY.—Our French contemporary, *La Revue Chronométrique*, gives the following two new processes for the manufacture of this material:—1. Dissolve two parts of pure india-rubber in thirty-six parts of chloroform, and saturate the solution with pure amoniacal gas. The chloroform is then distilled at a temperature of 165 degrees Fahrenheit; and the residue, mixed with phosphate of lime, is firmly pressed into moulds and dried. This composition imitates to a remarkable degree the natural ivory. 2. Is a simple combination of papier-mache and gelatin. Billiard balls are made of this substance, and are said to be quite as hard and elastic as genuine ones, and can be sold at one third the price of the latter. They can be thrown from high elevations upon pavements without injury, and will withstand heavy blows with the hammer. This composition is called "Paris marble" and has been successfully used for raised ornamentations of ceilings, and all shades of most precious marbles have been imitated with it.

HOW TO CLEAN WATCHES.—A correspondent of *La Revue Chronométrique* recommends the following method:—Dissolve in about a quart of rain water a piece of Marseilles soap, about 1½ inch square, pare it finely and add a small piece of black soap. Then boil and strain, and bottle the liquid. When about to be used, pour a little into a capsule, immerse the parts in it, excepting those fixed with gum lac, and boil it slightly. Rinse them afterwards in rain water, gently boiling, and then plunge them into alcohol. When taking them out, dry them with a linen rag. This process will clean the pieces much better than benzine. Should the polished wheels turn a little brown, the stains can easily be removed by lightly passing a pencil brush, dipped in water mixed with oxalic acid, over the stained parts and then dipping them in water and alcohol; but care must be taken not to touch the steel. If required, it may be touched up with a chamois leather.

RIGHTS OF INVENTORS AT THE PARIS EXHIBITION OF 1878.

THE exclusive right which a patent confers on an inventor, ceases at the frontier of the country where the patent was granted. If patented in France only, the inventor has no protection against imitations in foreign countries, and if he has a foreign patent only, he cannot be protected against imitators in France. As the Exhibition will be Universal, no doubt imitations of patented articles will be exhibited there. But these will be looked upon as if they had never left the country in which they were manufactured. The enclosure of the Exhibition will be neutral ground, where every one shall be thought at home. The enclosed space will be transformed into a general custom-house. The goods will travel in transit, and be considered as if they had never left their country. If inventors wish to monopolize the manufacture of their articles, they must therefore procure patents in other countries as well as in their own.—*Revue Chronométrique.*

CHINESE SILVERSMITHS.—The men of the Shan tribes, in the kingdom of Pong, China, are expert silversmiths. Their enamels are very brilliant, and employed with beautiful effect in the floral patterns which form the principal stock of designs. The only other forms of ornamentation, the rope-shaped fillets and rounded studs or bosses, singularly resemble those found on the diadems or armlets of the early historical periods of Scandinavian art. The plain torques or neck rings in use, especially among the Hotha Shans, only differ from the ancient Irish type by their more rounded form, and by their pointed ends being bent outwards in lieu of being expanded into cymbal-shaped faces. Another kind of torque is of the same shape, but covered with leaf ornaments and cones in filigree and enamel, alternating with red or blue stones or pieces of glass. Torque-like, hollow rings, covered with floral enrichments, are worn as bracelets; sometimes they are gilt with very red gold, and enamelled, a jewel being usually set in the centre. Another form is a silver hoop, nearly two inches in breadth, with rounded edges and filigree borders, most elaborately set with floral rosettes of three circles, rows of leaves, brown, green, and dark purple, centred by a large silver stud.—*Journal of Applied Science.*

A VERY interesting and instructive Lecture on the Watch, what to make, and how to make it, was delivered by Sir John Bennett, on the 20th ult., at the Congregational Chapel, Ruol Road, Bermondsey. Want of space precludes our giving detailed quotations of the excellent lecture in the present number, but hope to be able to do so in our next. The lecture was to have been repeated at Ealing, on the 27th ult., but through some misunderstanding on the part of those who had previously promised the room for another purpose, it has been postponed.

An expedition has sailed from Naples for the purpose of securing and working the coral reef discovered by the commander of the United States steamer *Gettysburg*.

EARRINGS are either quite small and short as solitaire diamonds and jet and shell balls, or else they are long and elaborate with pendants for full dress *parures*. A ball surrounded by a wheel is a favourite design for both silver and gold earrings.

A **NOVELTY** in jewellery is the Cloisonne enamel applied to gold. The grounds are lapis lazuli blue, dark yellow, or olive, almost covered with floral decorations done in Russian style, or for lighter surfaces blue and white enamel are employed on gold, and classic subjects are chosen. For very rich jewellery the Limoges enamel is used in mythological devices, and set with precious stones.

YANKEE girls are now cutting and polishing diamonds. The art has been monopolized by Amsterdam experts, who have uniformly refused to teach any apprentices except Dutch boys of their own selection. Henry D. Morse, after employing Dutch diamond cutters in Boston for many years, learned the secrets of the trade. He opened a shop in Roxburg, and privately taught six or eight young women this mysterious occupation. He finally apprised his Dutch workmen that American boys must be taught by them. They peremptorily refused to instruct the apprentices. He then discharged them, and brought the young women from Roxburg to fill their places. Twenty-three of them are now at work.

JEWELLERS AND GOLDSMITHS MEETING AT NATIONAL CHAMBER OF TRADE.

ON Friday evening the 16th ult., a special meeting of representatives of the Jewellers and Goldsmiths, wholesale and retail, was held at the Offices of the National Chamber of Trade, 446, Strand, to discuss certain resolutions propounded by Mr. E. J. Watherston, of Pall Mall.

The chair was occupied by Mr. D. Gass, who was supported by Mr. Connell, Mr. George Lambert, Mr. Neal, Mr. W. Barnard, Mr. Atkins, Mr. Smiley, Mr. Adams, Mr. Stephen Smith, Mr. Piekford, Mr. Fred. Morrison, Secretary of the Chamber, and many others.

The Chairman briefly opened the proceedings and said they had been called there to discuss certain things which might be a very great benefit to all branches of the trade. He would at once call upon Mr. Watherston to move his resolutions.

Mr. Watherston said as he was responsible for calling the meeting, he wished to inform them that it was a preliminary meeting. In the first place no one in that room would deny the advantages which had accrued to this country from free trade during the last forty years. Granting, as they all must, that the material wealth of the country had been increased to a very large extent by the large findings of gold, they must still thoroughly understand that the great distributor of that wealth over the surface of society in England, had been free trade. Let them see what free trade had done since the passing of the Corn Laws. Beginning in 1831—during the years 1842, 1845, 1853, and 1862, no less than 1,200 taxes had been taken off. Up to 1876 from 1861, he found, from statistics, that the taxes were reduced in that time 30,837,689*l.*, and at the same time the national prosperity had so increased that, whereas in 1859 the Budget only amounted to 65½ millions, in 1876 it was nearly 78 millions. During that period the National Debt had decreased by 75 millions. To show the increased prosperity of the country under free trade, he might mention that whereas in 1863, 9*d.* in the pound Income tax produced 10½ millions, in 1874, 3*d.* produced five millions; and whereas a penny income tax brought in some 800,000*l.* some few years ago, it now brought in nearly 1,700,000*l.*, showing a material increase in the national prosperity. In 1859, the Post Office produced 3,162,000*l.*, in 1874, 5,792,000*l.* Then the Excise in 1859 produced 17,902,000*l.*, and in 1874, 27,172,000*l.* That had been the result of taking off the taxes from 1,200 different articles. Taxes had been taken off every trade, with the exception of the silver and gold trades. He of course purposely excepted the trades in malt liquors, spirits, &c., but of trades of much the same character, such as furniture dealers, carriage builders, &c., all other trades had been relieved from taxation, while their trade had not been relieved at all. The result of that was, that while other trades had become increased, and their representatives had become rich, and the world's treasures had been scattered amongst them, their trade had made no progress at all. On the contrary, instead of the trade having increased, it had positively decreased. Let them take the Statistics which had been prepared by the Select Committee on the depreciation of silver. In 1855 the amount marked was 994,360 ounces, while in 1875 it had positively decreased to 886,493. He was told that in 1876 it was lower still, and he believed that in 1877 it would be lower again; all going down, down, down! Of course the duty went exactly with the number of ounces, so that whereas in 1855 the duty produced 74,577*l.*, it now only produced 66,487*l.* Regarding all these things as facts, it seemed to him monstrous for them to allow their trade to be further decreased a single year, if they could help it. The time had come for them to go to the Chancellor of the Exchequer and say "Here is a trade groaning under this unjust tax and it is your duty to take that tax away." The tax upon spoons and forks was 20 per cent.; the tax upon silver plate such as tea sets, &c., was 12½ per cent. It was said that the trade was a luxury. He did not deny that his trade was a luxury, but he contended that it was not such a luxury as several other trades. It was an extraordinary fact that the greater the luxury the less the tax. If he had an order for a service of plate of a very elaborate character, if he were charged 30*s.* per ounce for it, the duty was 5 per cent., therefore increase the art or the luxury and down went the tax. A spoon or a fork was not so much a luxury, as was a diamond ring or a carriage, and so the argument might be carried on. Other trades had no sort of tax upon them. Look at carriage builders, they had no tax upon them. The argument had been used with the silver trade, that they were peculiar, as their goods did not wear out. Well St. Paul's Cathedral

did not wear out. Builders put up large houses and they did not wear out, at least in our time. Picture dealers paid no duty, and surely a picture was a greater luxury than a spoon or a fork. He was at Jackson and Graham's the other day, and they showed him a cabinet to cost 5,000*l.*, and therefore the question of luxury fell to the ground. The tax had not always been 1*s.* 6*d.*, there was a time when it was only 6*d.*, but when George III. of blessed memory wanted to go to war he sent it up to 1*s.* 6*d.*, and there it had been ever since. Therefore they were in reality paying a war tax. He supposed no other trade would follow their example and pay a war tax in 1877. He apprehended that no man in any other trade would allow such injustice to go on for another day. Why was the trade so small as it was? He would remind them that last year there were only 886,000 ounces marked, if they took that at 10*s.* an ounce, which was a very fair average, it followed that the whole trade of the United Kingdom did not amount to more than 445,000*l.* a year, and although the wealth of the country was so immense as to be almost incalculable, they had a paltry trade of 445,000*l.* a year. Why? Simply because there was a 20 per cent. *ad valorem* duty on some articles and 12½ per cent. on others. Why was then trade small? Some people said it was because of the electro-platers. That was a good argument for taking off the tax at once, because their friends the electro-platers were not taxed at all. But the most extraordinary thing was, that the letters he had received in favour of the movement came from first-rate people in the plating trade, and they, like all sensible people who lived at Sheffield and Birmingham (Voice: Query?) said off with the tax at once. But while it was a fact that the electro-platers had robbed them of a good deal of business, an enormous amount he had no doubt, that did not seem to him to upset the argument that if the duty of 20 per cent. was taken off, they would sell more silver. Another argument was, that people would not buy goods because they would get robbed of them—servants sold and pawned them. What was more absurd or ridiculous, that they should allow 20 per cent. to remain on their goods because the public would get robbed of them. The whole question was one of fairness to the entire trade. Is their trade to be taxed, and another not? Is one trade to be crippled and another encouraged? Another reason why the duty should be taken off, was the great depreciation that had taken place in the price of silver. The first argument he had given him against the tax being removed, was that they would all be ruined. In 1831 they heard the same argument from those who were alive at the time. Farmers said if the tax was taken off the corn they would all be ruined. Well, farmers were not ruined yet, and he saw they brought in fifty-three millions of foreign corn last year. During that time, and since, 1,200 taxes had been taken off, and yet John Bull was getting on very well and people were prospering. He believed that the Chancellor of the Exchequer would have a small surplus, not a very large one, but still a surplus, even though trade had been bad. Then another argument was, that the public required protection in buying spoons and forks, silver teapots, &c. But they did not want protection in buying electro-plate nor in buying watches, nor anything of that kind, and if they wanted protection in one thing, they wanted it in another. That was what he called "monthly nurse" legislation. The public required no more protection than was necessary for a man to use his common sense when he was buying anything. Then another argument used was, that if the tax was taken off the trade would not increase. But it was not evident to his mind as anything could possibly be, that if the tax was removed the trade must increase, it was unreasonable to suppose otherwise. This argument was a flat contradiction to the whole history of the country during the last forty years. Then another thing that was said was that foreign plate would come in. There was the foreigner, the "poor foreigner," argument. They had had that over and over again, "the foreigner who was to come and take away their trade." That was absurd. He could not see that the foreigner would be in any different position to what he was now. He could bring in his plate and pay the duty, and so be in the same position as the rest of them. They had heard the same argument about French jewellery; the French jeweller was to come in and ruin them all. Well, that had not come to pass yet. And the same argument was thrown out directly a reform was wanted. There was another argument used, that taxes must come from somewhere. They knew that the Excise brought in some 27,000,000*l.*, which was a great increase on former years, but no one would say that because the Excise had so increased everybody was getting drunk. It was traceable to the greater material prosperity of the country. In proportion as they got on, people took a little more wine for their stomachs' sake, or a little more beer, and so on. Then with tobacco, the people who were getting on bought more cigars. Then there was another argument, viz., that "the public

would not be benefited," and that was an argument he liked best of all. He desired that his *trade* should be benefited by a reduction of taxation. At the present time they were selling spoons and forks at about 7s. 6d. the ounce, and getting nothing or very little out of them. It seemed to him that perhaps if they got the duty off they might make 6d. an ounce out of them. He had not come down there to argue the case in the interests of the British public, but to argue it in the interests of their trade. He cared nothing for the interests of the British public; he had to look after himself. Then he got another argument, that silver plate tea sets, &c., were not selling at the present time. He denied that, and thought they were selling very fairly; and then, if they were not selling, it was desirable to take the tax off and make them sell. With regard to the licences, the whole thing was in a nutshell. Why should his trade pay for a licence, and his neighbours, with few exceptions, nothing whatever? Why should not a picture dealer and everybody else pay licences if he had to pay for one? He had suggested to a member of the Government that one general sum should be imposed for all trades and then none could complain; and he thought that would be a very good weapon in the hands of the Government to put a stop to the proceedings of a fraudulent or unprincipled tradesman, and adulteration.

A voice: They do not exercise it with the publicans.

Mr. Watherston continued that he should like to see the Government with the proposed power and believed it would work very well. He thought it would suit all for each to pay a guinea for his right to trade, and only hold the right from year to year. But that was only a very small part of the question. What he wanted them to arrive at was that the licensing question required revision. Passing to the subject of the third part of the motion, he apprehended they were all of opinion that they ought to retain hall-marking (hear, hear.) He made no proposal whatever to abolish hall-marking, but what he wanted them to agree to was, that 9, 12, and 15 carat gold should no longer be hall-marked. It was an anomaly altogether that Goldsmiths' Hall should allow the marking of stuff as gold which ought to be called brass. He then called attention to a piece of plate, the hall-mark of which was in the centre, and said it was absolutely barbarous to allow hall-marking like that to go on.

A voice: Where would you have it put?

Mr. Watherston said he would have it put somewhere where it did not interfere with the artistic design or beauty of the article in question. He then read a number of letters he had received from various gentlemen, for and against the movement, and said that no great reform had ever yet emanated from the heads in any trade. On the contrary, they had generally been carried in the teeth of their most strenuous opposition, and therefore he was perfectly satisfied when he received the letters, and he earnestly hoped that the same thing would occur again. He had called the meeting and came there to hear what other people had to say on the subject. In conclusion he moved the resolutions as follows:—

1. "That the duties now levied upon gold and silver plate are unjustly oppressive, and that with the view to the development, especially of the silver trade, an effort should be made for their immediate abolition."

2. "That the imposition of licences on the gold and silver trade, is exceptional and unjust, seeing that other trades are entirely exempt."

3. "That hall-marking, as at present practised is impolitic, and that the Acts of Parliament affecting it require revision."

It was decided to discuss the motions *seriatim*.

Mr. Connell said he would second the first resolution but had very little to say upon it. He had long been engaged in the silver trade, and as a question of free trade thought that all trades should be free, and that it would be a great benefit to the silver trade if it was entirely free, and therefore he seconded the resolution.

Mr. George Lambert said he came before them as a dissident to the resolution in the double capacity of a shopkeeper and a manufacturer. He entirely dissented from all that had been said. The most ridiculous arguments had been used to show the necessity of abolishing the tax. The public needed protection, that was to say, that where they bought a standard article they should have a guarantee of it in the shape of a mark. And with regard to themselves, they saw how fraudulent the trade was by the prosecutions which were going on even at the present time. Therefore the public did require protection, because silver and gold were not like other things which could be pronounced good or bad by looking at them, at least by the general public.

Mr. Connell said the first motion related only to the subject of duty. Mr. Lambert was speaking to the third proposition.

Mr. Lambert thought the tax was a very just one. Silver was a luxury, and persons who could afford to buy silver could afford to have it taxed. In America he believed it was not taxed, and the consequence was that people made up what they liked. He quite agreed with the 1s. 6d. the ounce, and had not heard one single argument why it should not be taxed. He was old enough to recollect when spoons and forks were sold at 9s. the ounce, and it was Thomas Cox Savory who got them down, and he had just refused a Government order because he would not take an order at 8d. profit. Mr. Watherston had been complaining, but did it pinch him? Did he suffer from the tax? Had he done what he had at the request of the trade, or had he done it on his own account? Did he want to raise himself in public opinion and bring himself before the world? Then he understood his argument. But he apprehended the trade had not been pinched by it. But it seemed to him that Mr. Watherston's remarks were deeper than the duty or the hall-marking. He read it as an attack on Goldsmiths' Hall.

Mr. Neal asked where the duty went to.

Mr. Lambert said to the Government. It appeared to him that the present movement was a slight upon the Company, and he did not think Mr. Watherston should have brought it forward. He did not think they, in the trade, should stir dirty water.

Mr. Walter Barnard said he was most anxious that they should come to the very root of the matter. He was not an "orator as Brutus was, but as they knew him, a plain, blunt man, that loved his trade." To his mind Mr. Watherston's arguments were mere assertions, and not arguments at all. He could not lay hold of one single direct argument. There was a great deal of assertion which was worth nothing more than the value which was attached to it on account of the person who said it. Now they did not want assertions, but to look at the matter and see how it would be likely to benefit the trade if the duty were taken off. He would say first of all that it was a question which most intimately affected the manufacturer, the silver plate manufacturer, and did not affect so vitally the shopkeeper. Whatever might be the results of abolishing the duty on silver, he conceived the shopkeeper would feel its effect, but the manufacturer had the right, and he would ask them as manufacturers to look into the matter, because if their rights were not upheld, they might be very certain that the shopkeepers would not especially look to the interest of the manufacturer. He thought their interests would be very seriously and vitally affected. He would say that the idea that a great development of the trade would ensue from the abolition of the duty was a fallacious idea altogether. Mr. Watherston had been thinking over the matter, and had brought forward a whole regiment of statistics, and no end of figures, and had only given three or four days, and very few of them had been able to give any serious or deep thought, such as he had, to the matter. Of course the increase in the material prosperity of the country was a fact that none could deny, and side by side with that was another fact, that the manufacture of silver plate had decreased a little. There was the question, Why? Mr. Watherston said it was because of the 1s. 6d. duty. He did not think so. He thought one of the reasons why the manufacture of silver plate had not increased with the increase of the prosperity of the country, was because of the large manufacture of electro-plate. They must remember there was deposited upon electro-plate per annum about one million ounces of silver, or in rough figures, about 15 millions of pounds sterling of manufactured plate. Then Mr. Watherston had not taken into consideration in his arguments, one important point, viz., that silver plate was not perishable, and did not wear out, for good silver plate would wear for generations, and the public would buy it up when it got to be 50, 60, or 100 years old. There was an objection on the part of the public to put their wealth into silver plate to any large extent. Twenty or twenty-five years ago, people were not so rich as they were now, by an enormous amount, and yet they bought considerably more silver plate than they did now. Were they in a better position to pay the duty? How was it that people who had now 4000l. a year, when they had only 3000l. then objected to put their money into silver plate? Must it not be that there was an objection to do so? He could see a good reason why. Their friends bought better pictures and richer furniture, and as a man increased in riches he did not put his money into silver plate, but into those things indicated, and he would ask those gentlemen who were present, whether they did not do the same. In his opinion there was not the possibility of that elasticity in the trade which should make people, when the duty was taken off, immediately rush to buy silver plate. Twenty per cent. or 12½ per cent. was not sufficient to make people put their money into silver plate. They knew there was an enormous lot of silver plate in bankers' cellars; and occasionally

they got communications "please let us have something out of the way, something quite novel for a gentleman who has got everything." They might look at it in the broadest way they liked, but they could not see how it would increase the trade; they would be glad if they could. Then as to second-hand plate, if they could get that melted down it would improve the trade. Then the abolition of the duty would place the manufacturer in an unfair position with regard to the foreigner. They were bound to have a little patriotism, and he thought the shopkeeper ought to support the manufacturer just to the extent to help him to manufacture for his own country, and not put him into an unfair position of competition with the foreigner. They ought not to endeavour to legislate so that the manufacturer should be ruined or destroyed. After the abolition of the tax, as certain as that the night followed the day, so certain would the abolition of the marking follow. They might say they did not want it as much as they liked, but it was quite certain that when the duty was taken off, the hall-marking would follow.

Mr. John Neal wished to speak as a shopkeeper. He was entirely opposed to Mr. Watherston's first proposition, because he considered silver was a luxury, that the 1s. 6d. duty was not felt, and he did not think it would increase the trade in silver, but would lead to the disuse of hall-marking, which would be a very great disadvantage and would lead to the introduction of silver from other countries by people who would declare that the silver was of a certain value, when it could not be tried, and so what would be sold as sterling silver might not be worth 3s. 6d. an ounce. He wished to move the following as an amendment, "That seeing the large stock of manufactured silver held by the trade generally upon which duty has been paid, and seeing also the severe loss it would entail and the serious disturbance it would occasion to the manufacturers, this meeting is of opinion that it would be impolitic to ask for the abolition of the duty levied on its manufacture, at present." He should say if there had been no duty on in the past there would be none now, and perhaps in the course of time they might reduce it, when the shopkeepers and manufacturers had got rid of their stock. There were a large number of shopkeepers to whom the taking off of that duty of 1s. 6d. would be a most serious loss. He did not think that the abolition of the duty on silver and gold would lead to any increase in the trade. They knew that people now kept their plate stored away at their bankers, and only got it out on special occasions such as "weddings," "coming of age," &c., using electro-plate for ordinary use.

Mr. Atkins seconded the amendment. He said a great deal had been said about the value of plate. Mr. Watherston had talked about 30s. an ounce.

Mr. Watherston: You might say 2l.

Mr. Atkins held that that amount of value could not be put in the silver, but was on account of the brain work that was in the article. There were only two classes of people who bought these goods—the rich people who could afford to do so, and the fools who could not afford to do so, but bought them for ostentation. As to foreign competition, that was absurd. He had been in Germany and France recently, and never saw anything there worth copying. He was in the case of Brian in the Criminal Court, and it was there laid down that if one part of gold were mixed up with 23 parts of alloy and melted up, it might be called gold, but if ten times the amount was laid on outside, it was only plated. They could not say the public did not require protection; he thought they did. When he went into a shop and bought a chain he wanted to know what it was.

Mr. Watherston said there was no duty on gold except on plate, snuff boxes, &c., gold mourning and wedding rings.

Mr. Atkins: The Queen uses a gold service.

Mr. Watherston said the Queen's service was silver gilt, with the exception of one article, which was made out of the snuff-boxes of George IV.

Here some desultory conversation ensued among the members present.

Mr. Watherston said if silver plate was a luxury, and people could afford to pay for the tax upon it, he wanted to know why pictures, which were a greater luxury should be let off free.

Mr. Atkins: Why should you have a great flow of eloquence and me none at all? (Laughter.)

Mr. Smiley said it did not seem to him that it was a question of luxury, but the question was whether it was fair that an article which came into competition at a cheaper rate, should be left perfectly free, while silver articles were taxed heavily. The different profits which manufacturers and shopkeepers were obliged to put on the silver, brought it to such a price that it was no wonder the

public, who wanted to use articles as much like silver as possible, bought electro-plate instead of silver. With regard to people not investing their money in silver, he thought it was only a question of cost. At the present time, although the country had increased in wealth, the luxurious mode of living had also increased. Where people used to give quiet dinner-parties, they now gave fashionable ones, where a large number of knives and forks were used, and therefore they had to buy them at the cheapest rate. He did not think he should vote on such a question at the present time, still he could not help continuing in the opinion that the abolition of the duty would be an inducement to the public to buy silver instead of electro-plate. But on the question of free trade, the argument about foreigners he thought was about the weakest argument that could possibly be used, because there was really nothing in it. If the foreigner could sell silver goods cheaper than they could, what was to prevent him paying the duty and selling them now? He did not think it was a question of foreign competition, unless, with the abolition of duty, they were to allow any quality of silver to be made up. As to the question of fairness he thought it an unjust thing to the manufacturer that he should be weighted with the 1s. 6d. tax.

Mr. Adams said he agreed entirely with Mr. W. Barnard's arguments, and really did not see what good either manufacturer or shopkeeper was about to gain if the duty was removed. The gentleman who had ruined the trade was Mr. Savory, and he had had the pleasure of telling him so to his face. He first started co-operation and wanted to do away with the middle man altogether. And if they took off the 1s. 6d. an ounce, Mr. Savory would do the same tomorrow; he wanted to know what good they were going to do.

Mr. Watherston: You are going to get an enormous increase of business.

Mr. Adams complained that they had had such short notice of the meeting, while Mr. Watherston had crammed himself full of statistics, figures, and arguments.

Mr. Watherston suggested that the meeting should be adjourned for a month.

Mr. Adams said he believed the abolition of the duty would be of no advantage either to the manufacturer or the shopkeeper.

Mr. Stephen Smith said Mr. Watherston's argument was that a great increase of trade would follow the abolition. He thought it did not matter to the general public who lost the profit as long as they got the article cheaper, whether it was the manufacturer, the shopkeeper, or the Government. In a very large branch of their trade, viz, in spoons and forks, there had been a great diminution of profit within the last fifteen or twenty years, and he thought he was right in saying that the result had not been an increase in trade but rather the reverse. The only other thing he would say was, that he thought it was very unwise at the present time to stir up the public mind on any such matters.

Mr. Watherston suggested that the matter should stand over for a time.

Mr. Atkins suggested twelve months.

Mr. Watherston said he just wished to warn those present that he meant to continue to agitate, agitate, agitate. He was going to make all the noise he could, and he was ready to subscribe 500l. towards the object he had in view. He should do all he could in all the large towns, Birmingham, Glasgow, Sheffield, Edinburgh, &c., to get the duty taken off.

Mr. Pickford hoped there would be a meeting very shortly on the question of licensing, as there was a very important question coming on which would greatly affect the trade.

Mr. Watherston said he fully meant to worry, worry, worry, until he got his own way.

Some further desultory discussion ensued, and the resolutions were put to the meeting, when Mr. Watherston's motion was rejected by 12 to 6.

Mr. Atkins proposed that the two last resolutions be adjourned *sine die*.

This was agreed to, and after some further conversation this motion was adopted.

A special vote of thanks was accorded to the National Chamber of Trade for lending the use of its rooms on the occasion.

The meeting then separated.

MR. JOHN JEFFREYS, of 14, Tottenham Court Road, has lately patented "Climax Solitaire, and General Dress Fastener," which has many improvements, it being without springs or movable pieces, and easily attached or detached. It will doubtless be in general favour and great use.

AN AMERICAN ASTRONOMICAL ACHIEVEMENT.

BY RICHARD A. PROCTOR.

AN American astronomer, Professor Young, of Dartmouth College, Hanover, N.H., has recently achieved a victory over a problem which has for many years foiled the skill of the best European observers: and, in so doing, he may be said to have added the keystone to an arch of no small importance in the edifice of modern astronomical science. It will be in the knowledge of most of my readers that astronomers have succeeded, during the last eight years, in measuring the rate at which some of the stars travel from or towards us, employing for the purpose what is called the spectroscopic method. I do not mean here spectroscopic analysis simply, but a special application of this now familiar analysis to measure the rate at which luminous bodies are approaching us or receding from us. The principle of the method is very readily explained. Light comes to us from the heavenly bodies as from other luminous bodies, in waves, which sweep through the æther of space at the rate of about 185,000 miles per second. The whole of that region over which astronomers have extended their survey, and doubtless a region many millions of millions of times more extended, may be compared to a wave-tost sea, only that instead of a wave-tost surface there is wave-tost space. At every point, through every point, along every line, athwart every line, myriads of light-waves are at all times rushing with the inconceivable velocity just mentioned. It is from such waves that we have learned all we know about the universe outside our own earth. They bring to our shores news from other worlds, though the news is not always easy to decipher.

All the celestial bodies are in motion amid the multitudinous waves of space. Something can be learned respecting their motions by studying the waves. If a strong swimmer were stemming a series of long rolling waves, their crests would pass him in more rapid succession than if he were at rest; if, on the other hand, he reversed his course, so that waves overtook instead of meeting him, their crests would pass in slower succession. One can easily conceive how, if he knew the exact rate at which the crests would pass him—so many, exactly, per minute—were he at rest, their slower or more rapid succession might indicate how fast he himself was moving, either from or towards them. If he were quite unconscious of his own motion, the effect would be simply that the distance from crest to crest would seem to be diminished in one case, lengthened in the other—that is, the waves narrowed or widened. Similarly with the aerial waves which produce sound. They are seemingly shortened when the source of sound is approaching, whether by its own motion or the hearer's, and lengthened when the source of sound is receding. In the former case the tone of the sound is made more acute, in the latter graver than it really is. This is strikingly illustrated when a swift train rushes past a station, the whistle sounding all the time, for there is a perceptible lowering of the whistle's note as the engine passes a hearer on the platform. While the train is approaching him, he hears a note somewhat sharper than the true note of the whistle; after it has passed he hears a note somewhat flatter than the true note. Still more obvious even to non-musical ears, is the corresponding change when two trains pass each other. In America, where a hideously clanging engine-bell is used, the change is very remarkable, inasmuch that a person unfamiliar with the arrangement actually adopted, would suppose a different bell was rung the moment the engine passed the hearer.

Light travelling also in waves, it is obvious that a similar effect must be produced by approach or recession, if only the rate of motion is sufficiently rapid. The swimmer of my first illustration must have a velocity comparable with that of the water-waves, or no change will be observed. The trains of the second illustration must have a velocity comparable with that of the aerial waves producing sound, or no change of tone will be produced. And in like manner, a star or other celestial body must be approaching us, or receding from us, with a velocity comparable with that of the æthereal waves producing light, or no change of colour will be produced, the colour of light corresponding with the tone of sound. Unfortunately for this purpose, though most fortunately in other respects, light travels at so enormous a rate that even the swiftest motions of the heavenly bodies seem rest by comparison. What, for instance, is the rush of even Newton's comet past its point of nearest approach to the sun, though at the rate of more than 300 miles per second, to the flight of light over nearly 200,000 miles in the same time? Very much as the movement of a person taking only six steps a minute, each less than half a yard long, to the rush of the swiftest express train. Yet astronomers have undertaken to measure the approach and recession of stars, moving—in some cases—

with less than a tenth part of that comet's motion, and whose velocity, therefore, sinks into still more utter insignificance by comparison with that of light.

Secchi claims (but not justly) to have first invented and applied the method used for this purpose, which consists in noting whether some known line of the spectrum of a heavenly body changes in position—either by moving towards the violet end of the spectrum, which would imply approach, or by moving towards the red end, which would imply recession. Of course the method is exceedingly delicate and difficult, involving a number of details which would be quite unsuited to these pages; but that, in principle, is its nature. Secchi tried the method, and failed to get any results from it, announcing his unsuccessful attempt in March, 1868. "Then," he says, "Mr. Huggins retried (*reproit*) the method, announcing in April, 1868, the discovery that Sirius is receding at the rate of 20 miles per second." Secchi should know well, however, that our great spectroscopist did not achieve this success in the few weeks between Secchi's announcement of failure, and Huggins's announcement of success. Months had elapsed, during which Huggins had been struggling with this difficult problem. If the enunciation of the method gave claim to the credit of its successful application, I myself could advance a stronger claim than Secchi's, for in an essay in *Fraser's Magazine* for January, 1868, I definitely indicated the nature and value of the method. But I would rather refer to the circumstance as enabling me to support Huggins's assertion that he was observing by this method for months before Secchi announced his own failure, for immediately on the appearance of my essay I received a letter from Dr. Huggins, mentioning (in confidence, until his paper should be published) that he had been for some time striving for success by the method I had described. This was nearly three months before Secchi's paper appeared. Subsequently Huggins observed by this method a number of stars, some of which he found to be receding from us, others approaching us.

Recently, however, the method itself has been called in question—first, by Van der Willigen, for reasons professedly mathematical, but unsound; secondly, by Secchi, because of his failure to see what Huggins has observed. Secchi had once based his attack on his failure to detect by this method the effects of the sun's rotation. As the sun's equator is spinning swiftly round, it is necessarily approaching on one side and receding on the other. By some amazing miscalculation, never yet explained, Secchi made the rate of this motion many times larger than it really is—so large, in fact, that the method we have described should have exhibited the sun's whirling motion. Small as the effect really is—amounting, in fact, only to a relative motion of about two and a half miles per second, Huggins did not despair of recognizing it; but he failed, though he used a double and twice-acting battery of prisms (the invention of the present writer—so far, at least, as its duplex character was concerned) made by Mr. Browning. Mr. Christie, of Greenwich, after resolutely grappling with the work of determining star-motions by this method, and in the main confirming Huggins's results, succeeded in recognizing by its means the known motions of Venus towards or from the earth, in various parts of their respective orbits. This was a great triumph, and more than met Secchi's objections. But Professor Young has gone, for the present, ahead of all other observers by this method. Availing himself of a beautiful extension of spectroscopic powers, due to Dr. Rutherford, of New York, he has succeeded in unmistakably recognizing the effects of the sun's motion of rotation by the spectroscopic method. Young has made the observations so satisfactorily that he relies even upon the difference between his results and the measured rate of the sun's rotation. He finds the sun's atmosphere (whence, of course, the spectral lines come) to be travelling faster than the sun's visible surface. To use his own words, "The solar atmosphere really sweeps forward over the underlying surface, in the same way that the equatorial regions outstrip the other parts of the sun's surface." The difference of rate is about ten miles per minute. For my own part, I doubt very much whether so small a difference can be indicated by this method. But even if we regard this part of Young's work as not yet proven—nay, even if we go further, and accept nothing more than the bare recognition of the sun's rotation by the new method—he must be congratulated on having effected the most delicate piece of spectroscopic observation yet achieved by man. He has placed beyond doubt or cavil a method of motion-measuring the most remarkable yet invented, and likely, as instrumental means improve, to be most fruitful in results of astronomical interest and importance.

THE diamonds of the French crown, which belong to the nation, will be among the objects exhibited at the Paris Exhibition of 1878.

GOLD.

(Continued from page 221).

WE have no evidence whatever as to the working of gold mines during the time of the Anglo-Saxons, though it seems apparent that this metal was certainly then most plentiful, as is proved by the advanced state of the jewellery and coinage of this period, many specimens of which are still in existence, also by the amount of "Dane-geld" paid to keep off the incursions of the Danes. Indeed the early English kings laid no claim to royalties, or to gold and silver, therefore we have no public records as to mining, until the introduction of the feudal system by the Normans, when the Crown at once claiming as its prerogative the right to everything not specifically granted by itself, and not only to all gold and silver, but to baser metals as well; these pretensions were, however, subsequently abandoned, the Crown being divested of all rights in minerals, except in gold and silver, which were retained "for the purposes of coinage, and to support the dignity of the Crown." Copper was generally claimed as a Mine Royal, on account of its containing gold and silver, as were also tin and lead. This claim to the precious metals naturally to some extent checked open gold working. We get abundance of evidence, however, that the existence of gold and silver, both pure and in connection with other metals, was well known.

These are only a few instances of royal grants. Many more might be given, but will be reserved until we treat of the different gold producing counties separately. From the time of Edward I. to Richard II., there was quite a mania for gold and silver mining, the result of which was the determination of a number of gold bearing localities. Holinshed records that Edward III. paid great attention to his gold mines; as did also Henry VI., and Edward IV. The reign of Elizabeth was prolific in schemes and speculations of all kinds. We find that in the seventh year of her reign, she granted the patents to Humphreys, Christopher Schutz, Cornelius de Vos (or Devos), Houghsetter, and Thurland, to seek for gold, silver, quicksilver, or ores containing them, in eight picked counties of England, namely, York, Lancaster, Cumberland, Westmoreland, Cornwall, Devon, Gloucester, and Worcester, in the principality of Wales, and in the pale of Ireland; with monopolies for alum, copperas, sheet copper, &c. These grants became the foundation of two Corporations, the Mines Royal, and the Mineral and Battery Works, afterwards united, and now known and subsisting as the "Mines Royal Company." Elizabeth seems to have looked pretty sharply after her own interests, for in the tenth year of her reign, we find her claiming the mines of Keswick, which belonged to the Earl of Northumberland. This celebrated case is fully set forth in "Plowden's Reports," and being considered an important trial, is usually called "The Great Case of Mines." Plowden says, "She took from the Earl of Northumberland his rich copper mine of Keswick, because of its holding so much silver and gold in the copper." The case was decided in favour of the Queen, the Justices and Barons unanimously agreeing "that by the law, all mines of gold and silver within the realm, whether in the lands of the Queen or her subjects, belong to the Queen by prerogative, with liberty to dig, and carry it away." And so firmly was the prerogative of the Crown thus established, that it was agreed a Royal Mine could not be severed from the Crown, but the judges eventually overruled this. The only doubt apparently existing in Elizabeth's time was whether, if gold and silver were intermixed with baser metal, the whole became a Royal Mine; the judges at last decided that even where the gold and silver in a mine of base metals (in the land of a subject) was of less value than the base metal, the mere fact of its existence made it a Royal Mine. Sir Edward Coke has since laid down the law, "That veins of gold and silver in the grounds of subjects, belong to the King by his prerogative, for they are *Royall Mines*."

Another unprincipled scheme of Elizabeth's was for working surreptitiously the Scotch mines during the minority of James VI., under grants obtained from him while yet an infant. These mines, as previously stated, had been most productive; we find a very interesting account of the Scotch gold working at this time, in a manuscript preserved at the British Museum, written by one Stephen Atkinson, who lived in this reign, and was originally a refiner in the Mint of the Tower of London, but afterwards became mixed up with the great speculators of the day. After giving a list of the chief places in Southern Scotland where gold was known to exist, he makes the following remarks as to the manner in which it was found:—

"The vulgar sort of Scotchmen usually sought for it upon those moors after a great rain, and after the splits of rains had run his

course; and this rain, or force of water, brought down no other gold than gold which before had been removed by the force of waves flood, and that gold was, and is, called superficial gold to this day. At the flood, natural gold and silver (which now are found in combs and valleys), were forced and torn from his bed or vein; and thither even our Scotch gold, which is now found in sterns, or in grains and pieces, did descend, or was washed down; on which valleys, combs, skirts of hills, or cloughs, even until this present day, it hath lain still, and not removed, except after a great split of rain, the force whereof doth break and wear the superficies of the earth, but not the solid earth; after which the Scotch men, and women, and children, run to seek for it, and do find it still, even unto this day; and thereby they find with it also the laxer stones in great abundance, and also much of the calamincer stones; but in the salineer stones it is as small as mustard seed, and some like meal; and in the sappar, in lumps, and like unto the fowls or birds' eggs. And the strangest of all is this; there is found natural gold linked fast unto the sappar stone, even as veins of lead ore and white spar do grew together, &c. But their usual manner is, when they seek for gold in combs and valleys, to frame or make a long sough or scouring place, into which they bring the stream water to scour away the light earth from the heavy sandy earth, and to cull away the first stones from the heavy sand, which heavy sand, or heavy earth, they scrape into their troughs or trays, and by stirring it and by washing the same often, there is found both rain gold, flat gold, pale gold, and black gold, yet all these be natural gold."

He continues:—

"I happened on a book of records at Crawford John, wherein were registered the labours of many employed by Mr. Cornelius (*Cornelius de Vos*), a lapidary in London, sent thither to discover the gold vein or bed, at the charge of merchants of London, who procured Queen Elizabeth's signet to the Scotch King, on account of which he was admitted, and got some gold on the mountains of Clydesdale and Nithsdale, some of it like birds' eyes and eggs, whereby he persuaded friends at Edinburgh to adventure with him, and procured a new grant to him and his co-partners in Edinburgh and London, of all the gold and silver mines in Scotland; each according to his disbursement, was to have his part. Some bought corn, meal, malt, and victuals; besides 5000*l.* Scotch money. Cornelius was chosen to govern and direct both artists and workmen, but they never sought gold in solid places, but in combs or valleys, where it had been washed down since the general deluge.

"Cornelius was called the Superior of His Majesty's Mines, and had authority to punish offenders, and to take workmen from England. He was obliged to bring all the gold and silver they got into the King's Mint-house at Edinburgh, to be coined, whereinto in thirty days' time they conveyed half a stone weight of natural gold, worth 450*l.* sterling. The workmen sometimes got gold at their own charges, by toleration of the Superior, which they sold at a mark sterling per ounce, 8*l.* Scotch. At the highest rate they had but twenty shillings sterling per ounce.

"Cornelius had six score men at work in valleys and dales. He employed both men and women, lads and lasses, who before begged. He profited by their work, and they lived contented and well. He bought their gold, which they washed for a mark sterling, which was worth five marks sterling per ounce.

"The Earl of Murray, deceased, and Cornelius, had a new grant from the Earl of Morton, next Regent, who also obliged him to bring all the gold into the Mint-house, which he got, and where it was coined into 3*l.* pieces, each an ounce in weight. Much gold was there bought of the workmen at twenty shillings per ounce."

The same book mentions one Abraham Gray, a Dutchman from London, who brought artists from England, and others of his own country, into Scotland, on the good report of the gold found there. He sold much of his effects, and procured his countrymen to adventure with him. He went with authority. He hired many inhabitants at 4*d.* per day, which contented them as well as 1*s.* did the English at that time. He had plenty of victuals in his storehouse at Wanlockhead, now in decay, and was supplied with all necessary tools. His workmen washed in the valley. He never sought on high hills or solid places for a bed or vein of gold. In valleys at Wanlockhead he got a good quantity of solid gold. He paid his workmen weekly, and lent money to divers before hand. With this natural gold, got in Graybeard's time, for so he was called because of his great long beard, was made a basin by a Scotchman in Edinburgh, which contained an English gallon, and was filled with coined pieces called unicorns, and presented to the French King by the Earl of Morton, saying, "Behold! all that is therein is natural gold of this kingdom, got by Abraham Gray, a Dutchman! Which Abraham Gray, standing by, affirmed upon oath,

and said he thought it did engender more ore within the earth, and that he observed it to be so, by the influence of the heavens, that it grew not by the power of the sun, moon, or stars, but by the omnipotent power of God. The Earl of Morton said, 'I also believe it engendereth in the earth, of water, and of earth, and that it was made perfect and malleable gold, from the beginning, by God the Creator.'"

Referring apparently to Elizabeth's agent, Atkinson says:—

"Mr. George Bones, an English gentleman, procured a commission into Scotland unto the gold mines, and I happened also on a book of his making in England. I carried it with me in Scotland, and compared the same, with the report of the country, and the countrymen at Wanlockhead said, 'it is so, and most true, that Mr. Bones discerned a small vein of gold, which had much small gold in it upon Wanlockhead.'"

Atkinson continues—"Mr. Bones swore all his workmen to keep it secret, and never discover it to the Scotch King, nor his Council, for so he had promised to do to the Queen of England, on whose letter he had a warrant from the Scotch lords to dig and delve where he would, so that it was after another fashion than Mr. Bulmer did.

"Mr. Bones digged several shafts in solid places, on the mountains in Robertsmoor, in Wanlockhead, and often found large pieces and much small gold. He gave 10 or 12 ounces thereof to make the owners of the ground his friends, and gave the merchants in England as much more.

"He did keep many workmen, and paid them with the same gold. He built houses to himself and people, but none for his Scotsmen, who sought their victuals and lodgings far from the works, which was a great hindrance. When they had filled their purses, Mr. Bones caused the said shafts to be filled up, and swore his agents and workmen not to discover the same, which was confessed by some of his chief servants since he died. He returned and told the Queen of England that he had performed and concealed his trust, that he had found a small vein of gold and showed a long purse full of it, which was admired and valued at seven score pounds sterling, without melting, but he had given much thereof away privily, and this had much of the salmoneer stones in it. He said, 'I have hidden it till my going thither,' for which she thanked him, and promised to reward this gift trebly, and that he should go again next spring at her charges to seek for a greater vein. He was killed by the breaking of a ladder in a copper work, at Keswick, in Cumberland."

Of another speculator, Mr. (afterwards Sir Bevis) Bulmer with whom Atkinson was for some time in partnership, he says:—

"Mr. Bulmer had a patent from the Queen of England, and King of Scotland, to seek for the gold and silver mines in any places of that kingdom, especially within these five moors or forests. On a Moor, in Nithsdale, his workmen got some natural gold, but built no houses there, which was a hindrance. On Wanlock Water, in Robert's Moor, he caused search diligently for natural gold, of which he got a pretty good quantity, and made watercourses to wash it; neither builded he houses there, but went to Thomas Flood's house in Lead-hills, and repaired not Mr. Bones's house at Wanlockhead, which might have sufficed him. Some say he found out the vein of gold Mr. Bones had discovered. In Frier Moor, in Glengonnar Water, in Clydesdale, Mr. Bulmer got store of gold, and there he built a very fair country-house where he kept great hospitality. He purchased grounds about it for cattle. By help of a watercourse he got much straggling gold on the skirts of the hills and in the valleys, but none in solid places, which kept him in great pomp, keeping open house for all comers, as is reported.

"On Short Cleuch Water, in Crawford Moor, he brought another goodly watercourse, and intended to make several dams there to contain water for the buddles, and scourers, and for washing gold, of which he found store, and purposed to have built there another dwelling-house, and cut his purse bottom by the extravagant entertainment with which he used strangers. Thus he wasted what he got in gold, which was very much. He got as much gold at Long Cleuch as would have maintained three times as many men as he kept, royally. From Short Cleuch he removed up the great hill to Long Cleuch Head, to seek gold in solid places; whereof he discovered a small spring, but there he wanted a watercourse to help him. This vein had the sappar stone plentifully in it, which sometimes held natural gold, but the salmoneer stones in that vein at Long Cleuch Head held much silver, and may prove a rich mine, if followed by such as know the nature of minerals. It is said that vein was powdered with gold, called small powdered gold. It was a vein and not a bed. They removed from Short Cleuch Trial to Long Cleuch Head, because the workmen found two pieces of gold there within 2 feet of the moss. The one piece was reported to weigh 6 ounces, and the other better than five, which

was thought to descend from the gold bed. None ever saw natural gold more perfect of God's own handiwork. It never was made by the art of man, but by the Great Philosopher of Heaven, who makes the true philosopher's stone of nothing, to be discovered in the bowels of the earth, called God's Treasure House. At Long Cleuch Head, as I heard it reported, and saw a piece of the same, was found a piece of brown spar, somewhat like sugar-candy, which, after it was broken, had in it an ounce of pure gold, which spar, as I suppose, is called the sappar stone in foreign nations. This brown spar stone weighed 2 lbs. troy.

"At Long Cleuch Head, Mr. Bulmer made a stamping mill, called abroad '*anacanago*.' Such are used in the West Indies, and in Cornwall, where it is sometimes called a 'plash' mill, to draw tin out of stones, in which the eye can discern little or nothing. By the same means Mr. Bulmer used to get much small meally gold at Long Cleuch.

"On Glengaber Water, in Inderland, in the Forest of Ettrick, he got the greatest gold in Scotland, like Indian wheat, or pearls, and black-eyed, like beans. He did not mind to settle there till a fitter time, being driven away by force of weather, and Mr. Bulmer presented Queen Elizabeth with as much gold as made a porringer.

"After Mr. Bulmer had lost his former living (fortune), he recalled himself, and wrote a book of all his works and devices, which he named '*Bulmer's skill*.' It was not printed. Among his many memorable deeds, a great part of his book was how the silver mines and mineral stones might be effected, and how his tin and coal mines, and salt works in Wales were followed, and how his lead mines in Mendip, were most profitable, of all others, to him.

(To be continued.)

BOOK NOTICES.

May's British and Irish Press Guide, 1877. F. MAY & Co., 190, PICCADILLY.

THIS useful little volume conveys considerable information respecting the various newspapers and periodicals of the United Kingdom. Great care seems to have been taken to ensure correctness, and among other features, will be found a list of all continental journals, and a directory of telegraphic news and reporting agencies. Altogether the work is one of many merits, and will be found most useful by all having any occasion for information on the subject of periodicals or newspapers, or those interested in press statistics.

Traité d'Horlogerie Moderne Theoretique et Pratique, par CLAUDIUS SAUNIERS.

THIS valuable work has been received and will be duly reviewed, in a future number.

DIAMOND CUT DIAMOND.

SOME years ago a celebrated pawnbroker, who shall be nameless, was induced to advance a large sum of money on the security of a valuable collection, but which, by an ingenious, if not very honourable trick, called "ringing the changes," was subsequently found to be transmogrified into a worthless amount of glass and pebbles. All endeavours to discover the perpetrator of the cheat being useless, the lender was, *volens volens*, obliged to be content with his loss, and the borrower seemed likely to escape with impunity, till the following clever ruse was adopted. Although a considerable amount had been advanced, it was only about one-third of their estimated value. One morning early his shop and the neighbourhood were found placarded with bills, announcing a robbery said to have been committed the night previous on the pawnbroker's premises, a large reward being offered, and specially for a collection of valuable jewels, naming their real estimated value, and describing them as they were represented to have been. This called forth the original borrower, who now came from his obscurity, and stating that he had come to redeem his property, being prepared to pay the cost of their redemption. Upon being referred to the bill notifying their robbery, he very naturally claimed their full value. Pending this conversation, however, a blue-coated official arrived, and the transmuted of precious stones found himself in the arms of justice. He was subsequently transported, and was so far punished, but whether the jewels were ever discovered "deponent knoweth not."

A SERIES OF PRACTICAL LETTERS ON EXISTING ILLS IN THE WATCH TRADE.

(Continued from p. 224.)

NO. 3.—ON REPAIRING.

(Chiefly extracted from the German of Seb. Geist.)

THEORY is no doubt of great value, but still the best books on horology would not suffice to make a good watchmaker. The mere teaching of the first principles of mechanics, physics, and mathematics, would never produce a practical workman. The apprentice must first use his hand and eye under direction and supervision of a practical master, and then his own endeavours, till his work meets with success. In workshops where repairing is the principal business, and only such new parts are manufactured as may be needed, the first lessons should be in the use of the lathe and drill. If a beginner is required to make some part of a watch, a large sized model of that part should be put before him, as well as a drawing, even if only in chalk on the work-bench. These illustrations often give the pupil a better conception of what is to be done than mere explanations, and it is essential for him to clearly understand his work before he executes it. He should also be encouraged to ask for advice where his own understanding fails, and if he is sensible enough to do that he may become a thorough workman, even in a "repairing" shop. The watchmaker's business is a difficult one to learn and to follow; very few trades require more perseverance, skill, and knowledge. Most trades serve the same purpose, viz., to show hours, minutes, and seconds, but they vary very considerably in size, shape, construction, and material.

The parts of a watch are numerous, and each of them consists of many minor ones. Look at a wheel, for instance, with its many teeth, and then consider that a flaw in any of these minute parts can prevent the proper working of the watch. Nor does all the difficulty lie here. These parts are small, and arranged in such a manner that even if the watch is taken to pieces the eye cannot discern them at once, and the examination of each article separately will not help much, because it is only the proper relations of the parts to each other that secure the desired result.

It frequently happens that watches are taken to be repaired, with all parts in regular order, nothing worn out, and not even in want of "cleaning," perhaps a glass splinter scarcely observable, even with lenses, interfered with its correct movement. The watch is put in "going" order, and the owner calls for it. On finding no visible alteration in its appearance, he thinks that the watchmaker has three parts of his money for nothing. Did not this watch give all the more trouble because the defect was hardly visible? It was not written on its dial that a small foreign body had lodged in one of its wheels; the workman had to find that out by patient and tiresome observation. Besides, do not doctors get their fee, even if the patient dies, and lawyers, if the suit is lost. But in practice, cases like the one mentioned, are rather the exception than the rule, and to one watch, without any essential faults, the workman receives ten spoilt ones, so that if he wanted to repair only good watches he might soon have to close his business. This is a stumbling block on which many come to grief, but the adoption of the following maxims will avert it.

1. Take only such watches in as are worth repairing. Some people, to economise, as they fancy, try to play the "watchmaker" themselves, or let some other "pretender" to the art practice with their watches, till they are past repairing. Then they go to the maker and expect their "botched" timepiece set in proper order at little cost. It is always difficult to say beforehand what amount of work repairing a watch may entail, but as a general rule no mutual satisfaction can be gained by repairing a bad one.

2. If new parts have to be made, they should answer the original construction of the watch. The proper performance of its service should be considered first, and appearance after, but all unnecessary work should be avoided.

3. When the watch is taken out of its case, or even before, a close examination should be made previous to taking it to pieces, and many of the defects will thereby be discovered.

4. If the watch should be so much out of order that its repairing would entail heavy cost, the owner should be made aware of the fact before the repairs are commenced, and this would save frequent dissatisfaction on both sides.

5. Unnecessary alterations should not be made, nor improvements attempted where not required.

Doubtless all my fellow-tradesmen knew already what I suggest to them now, but that alone will not remedy the evil. We must

all strictly act upon those principles, and none think that if "I refuse this repair my neighbour will do it," and it is by unity of action only, that the obstacles, so injurious to the interests of the trade can be overcome.

In order to learn how to repair any watch that may come to hand, years of industry, practice and patience, combined with a sound understanding, good vision, and good tools, are needed. Manufacturers of specialties, or city gentlemen who make the watch manufacture their business, know little or nothing about the difficulties to be contended with in small places, where competition among masters is generally strong and the choice of workmen limited. The principal must not only attend to the proper execution of the work, but also to the commercial part of his business. It is not enough to be a thorough workman, he must also be a business man. If his trade has taken larger proportions it is not advisable for him to sit down to serious work. He lacks the quiet attention so essential for his task, and things are liable to go astray. Besides, it is not always profitable for the master to work. But as the diversity of work is great, and the assistants at command have not sufficient experience to meet all requirements, the position becomes critical. It is just on account of this vast variety of work, that it takes even the most gifted youth a long time before he knows the routine of a workshop. In fact he often becomes old and starts a business on his own account, before he is really competent. All chances of further improvement would in such instance be lost, were it not for that GREAT BOON, OUR TRADE JOURNALS. We cannot attach too much importance to them, nor be too grateful to those of our colleagues whose disinterestedness causes them to share their superior knowledge and mature experience with others less favourably situated. While sitting comfortably at home we can now learn, what in former years necessitated years of practice and toil.

In times past when men of the same trade looked upon each other as enemies, where could you expect help or advice? We may congratulate ourselves that these selfish and uncharitable feelings are gradually passing away and nobler sentiments taking their places. Mutual exchange of ideas and experience will advance our art and further our interests, because the better our work, the more will it be sought after, since everyone likes to possess a reliable timepiece and is soon disgusted with a bad one. As already pointed out in one of my previous letters, "good work benefits and bad work injures all parties concerned." But it is rather difficult to determine the limits between good and bad articles, and many are at fault on this point. They sell a poor article, but they sell it cheap. It is true that even the worst cylinder, if only half regulated, will go a long time and well enough for ordinary purposes, so that the man has not actually deceived his customer. Nobody has a right to expect more of such low-priced watches. On this plea the sale of the worst watches might therefore be justified, and more so under particular circumstances. The watchmaker with small means has his wants like his richer brother, so he must sell too, and as he cannot afford to keep expensive watches, he gets cheap ones, regulates, and then sells them to earn a living. Should he go hungry, only to enable his better situated opponents to keep only fine watches, and give up the competition with cheaper ones? It would be uncharitable to reproach those strugglers for existence. Nevertheless, the sale of bad watches is imprudent, unfair, and injurious to all. Imprudent, because the product loses in the estimation of the public, and renders the sale of good ones more difficult. It is unfair, because falsehoods have to be resorted to to effect the sale, as no one would buy a doubtful article. And it is injurious to all, because not only the two parties concerned in the bargain, but the trade at large, suffer by the transaction. The same thing is also applicable to good and bad work in repairs. The question is how to remedy these evil influences? This is a task to be accomplished by proper trades' societies. These unions should train up good workmen, and apprentices would have better instruction. In larger towns a division might be organized, and able men with slender means might cultivate some special branch of the business, where assistants and apprentices could learn the different branches in turn. All these are questions which should be well ventilated in our Trade Journals, and more good may be expected from those discussions, than from numerous scientific dissertations.

PRICES CURRENT FOR GOLD AND SILVER—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY. Fine Gold, 84s. per oz. Fine Silver, 4s. 8d. per oz.

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QUERIES AND REPLIES.

22-CARAT GOLD.—"H. H. P." asks through a contemporary, "I have about 2dwts. that I want to make into wire, but after melting it I find it is so molten that I can't draw it, neither will it stand hammering. Will some reader kindly help me out of the difficulty?"

"DENS" replies:—"If 'H. H. P.' cannot use the blowpipe and charcoal sufficiently well, he should melt in a $\frac{3}{4}$ in. crucible, because unless fine gold is thoroughly melted, it will not work free from cracks."

JEWELLERS' SOLDER.—"EMBRYO" asks through the same journal.—"Will some reader inform me what the solder is composed of such as is used in the manufacture of lockets, &c.? Also 'panel' solder, and how is the solution of borax made and used? Particulars how to make a pumice stone devil, for soldering small articles, and the difference between hard and soft soldering, will be very acceptable to one not learned in these matters. I have an ordinary blowpipe and spirit lamp. Perhaps 'Isleworth' will be kind enough to look at this."

"ISLEWORTH" replies:—"I would not advise 'Embryo' to meddle with making his solder unless he intends going in for it as a regular thing. Scarcely two solders are made alike, as every working jeweller has his own particular receipt, which although not differing in the main, has still either a little difference in the proportions of the metals, or, now and then, something added by the workman to suit his own particular fancy. 'Embryo' can buy all the solders he wants to use at any of the tool-shops (jewellers'), if in London, in Wilderness Row, Clerkenwell. Charcoal is the best thing for soldering on. To hard solder: Get a piece of common slate, 3 or 4 in. square, and a glass bottle to hold water in, fitted with a cork, with a notch cut in the side to allow a drop of water to come out. Get a small camel's-hair brush and some borax. Wet your slate by dropping some water from your bottle on it, and rub your borax on it until you have got a mixture the consistency of cream, or a little thicker, then cut your hard silver solder into strips, very fine, and then again into pieces to suit your convenience. Having thoroughly cleaned away all dirt or grease from the parts you wish to solder, put some of the borax to the parts, and some solder with it, keep your hand steady and blow until you get a bright red heat, when you will observe the solder run wherever you have put the borax, and having a sort of glaze over it. You must bear in mind not to put your borax except where you wish your solder to run, as it may run in the wrong place. Hard soldering always requires the article to be gilt or polished, &c., afterwards, as the action of the fire turns the colour and softens the article also. To soft solder: You can buy your soldering fluid at the tool-shops, but it is easily made. Three-pennyworth of spirits of salts (from the chemists), cut up some zinc and put it in the bottle until the strength of the spirit has evaporated. It will then be the colour of the zinc. In soldering, use a piece of iron wire to apply the fluid, and cut some small pieces of solder (which you can buy) and place wherever wanted. Then apply blowpipe very gently, taking care not to blow your solder about—until it runs as you want. You must be very particular in applying your fluid, as the solder, if at all 'quick running,' will run all over the place, and it is very difficult to remove, and also very unsightly. You can get your charcoal at the tool-shop, and you will want some binding wire, which you can obtain at the same place. This is useful in tying your articles in the position you wish to solder them."

WATCH QUERY.—"MAGNETISM" asks:—"Being a good deal in the way of permanent magnets, and sometimes forgetting to take my watch off, it gets magnetised, which makes it gain or lose. If I had a gold hair-spring fitted instead of the steel one, would it prevent its being affected by magnetism? If so, could I have it done; or could any reader suggest a remedy?"

The Replies received were as follows:—

By "STUART MURRAY."—"The only permanent remedy that I can suggest for the prevention of the magnetisation of this watch is the following:—Take a balance and balance-spring made of aluminium bronze, and if the instrument is a lever, let the lever be made of silver, nickel, or other non-attractable metal. First of all, I should be inclined to try the effect in the change of the balance and spring, for that is where the principal mischief works, before going any further. To be sure the watch can be demagnetised, but, under the circumstances, that would have to be too often repeated to be pleasant, and you cannot be always 'dosing' your timekeeper. The cases, too, ought to have the spring catches removed from them, and be made to snap on themselves in the way that some best work does. The fact is, the remedy here proposed—and it is about the only one of any lasting value—is akin to that of the Yankee's new blade to the old handle, and afterwards a new handle to the old blade, so as to retain 'the same knife, you see, sirree, from year to year, as blades and handles wear out. I am strongly of opinion that the cheapest way, after all, would be to have a new watch made for the special purpose required, about which there is no difficulty whatever."

By "F. C. PUTLEY."—"Magnetism" should have a gold hair-spring put to his watch, and if the balance is of steel let that be replaced by one of gold, if the watch is considered worth it; if not, a brass balance would be cheaper."

ANEROID BAROMETER.—"F. C. PUTLEY" asks:—"I have an aneroid which behaves very strangely. It rises and falls in a very wild and

uncertain manner, while a Fitzroy remains stationary or nearly so. For instance, one morning I found it had fallen nearly $\frac{1}{2}$ in., and in the course of the day it rose two-tenths, the Fitzroy by which I set it remaining unaltered. The barometer is a common one, and there is no visible means of getting at its internals. There are three screws in the back besides the adjusting screw. I thought these held the glass, but if I remove them I cannot get it apart anywhere; and, moreover, if I move either of them, it alters the position of the hand as much as if I turned the adjusting screw. Will some one tell me how to make it right? I understand the principle, but have had no opportunity of examining the construction."

The Replies received were as follows:—

By "M. E."—"The screws on the back of the aneroid barometer, besides the adjusting screw, are probably for holding the vacuum pan, and supports to the motion. Unscrewing them, of course, permits the hand to move, but it is also likely to let the working parts come apart inside the instrument. They are generally put together with a spring ring slipped over the front glass on to the body of the instrument, and a good strong pull will remove it. The hand is generally also tightly pushed on, and can be drawn off with care, the dial being then lifted up, all the working parts are exposed, and readily accessible."

By "W. J. LANCASTER."—"No doubt the defect in your barometer is due to the back of case pressing upon the adjusting screw. If you will look at the back of barometer you will see a small hole, and immediately underneath an adjusting screw. Note first whether this screw is loose, and second, whether it presses against the back of case; it evidently does so, on account of alteration when the other screws are moved. The three screws ought not to affect the barometer in any other way. You can easily take the barometer to pieces; by removing the glass and bezel, the whole slides off the body part of case. Then gently remove finger, and afterwards dial. You will be able to alter any portion inside case with ease; or by taking a screw out of the back you may remove the whole of the internal fittings."

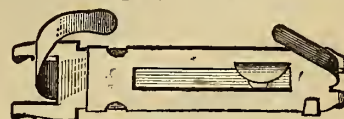
By "MORAVIA."—"May not the Fitzroy barometer be in error? My impression is that, if Mr. Putley examines it, he will find the screw at the bottom screwed up instead of being as low down as it will go. Thus the cistern is filled, and no room is allowed for the mercury in the tube to enter when the barometer falls. By this means the aneroid will do its duty, but the Fitzroy stand still. If Mr. Putley will send you the date when the aneroid fell nearly an inch and rose two-tenths, I will tell him which was correct; or to make assurance doubly sure, let him send half a dozen comparative readings with dates and time of observation. I should advise him not to interfere with the mechanism of the aneroid."

LONG SIGHT AND TELESCOPES.—"NOLLA" asks:—"It is well known that inhabitants of large open plains, as well as sailors and professional hunters, have, as a general thing, long sight; while, on the other hand, students, engravers, watchmakers, and those who follow similar callings, are often short-sighted—thus showing that the powers of the eye, as well as of other parts of the body, may be modified by use when long continued. Now I should like to know from those who have had experience, whether the use of the astronomical telescope would be likely to render one far or near-sighted. The objects looked at are distant enough truly, but what about the effect of the eyepiece on the vision? Are not microscopists apt to be near-sighted? Is it known precisely what blinded Galileo?"

"W. J. LANCASTER" replies:—"The habitual use of the telescope tends to lengthen the focus of the eye employed. This I know to be a fact in many instances, but at the same time I cannot give a reason why it should be the case, although I have endeavoured to work it out, but have failed. My right eye is not only of a longer focus than the left, but it is also partially colour blind, when compared with my left eye. Regarding microscopists I cannot be so certain. I know many who are long-sighted, and but few short-sighted, but I cannot more easily understand that. The searching for minute animalcula, &c., apart from the use of the instrument, would have a tendency to produce myopism."

NEW PATENT WATCH AND CHAIN HOOK.

MR. W. POTTER, of 136, Aldersgate Street, has recently patented a suspending and suspender hook for show cards and tickets, and which seems to supersede all others hitherto used. The hook is shown in accompanying diagram. The suspending and



suspender hooks and the card or ticket are made to move together to the required position, so that the card or ticket does not project above or below, nor exceed the length of the holder, therefore it does not require more room than is actually necessary for display of the ticket, whilst its form and shape is concealed from view behind the ticket. The invention is perfect in operation, and will be found of considerable value to shopkeepers and others wishing for best display of show-cases or tickets.

THE
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A MONTHLY TRADE JOURNAL,

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades; published at MILNERS' BUILDINGS, MOORGATE STREET (OPPOSITE MOORGATE STREET STATION), LONDON, E.C. Booksellers and Newsagents supplied by Messrs. Catty and Dobson, 1, Ivy Lane, Paternoster Row, E.C.

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Cheques and Post-office Orders to be made payable to A. VICTOR, at Lombard Street Post Office.

SPECIAL NOTICES.

IN order to meet the requirements of the steadily increasing business of this Journal, the offices thereof have been removed to more eligible premises in MILNERS' SAFE BUILDINGS, MOORGATE STREET (opposite Moorgate Street Station.)

We must thank our patrons and the trade in general for the encouraging patronage hitherto received, and which has necessitated this removal, and hope to be favoured with a continuation of support in our new offices, where every exertion will be made by us to merit the confidence and promote the interests of the various trades represented by our paper.

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PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

848. **FRANK MORRIS**, of Swansea, in the county of Glamorgan, for an invention of "An improved 'sidereal' time piece."—Dated 2nd March, 1877.

883. **GEORGE BETJEMANN, GEORGE WILLIAM BETJEMANN, and JOHN BETJEMANN**, all of 36 and 38, Pentonville Road, in the county of Middlesex, Desk and Dressing Case Manufacturers, for an invention of "Improvements in the construction of dressing cases, jewel cases, game boxes, and spirit and other cases."—Dated 5th March, 1877.

1023. **EDWARD THOMAS HUGHES**, of the firm of Hughes and Son, Patent Agents, 123, Chancery Lane, London, for an invention of "Improvements in apparatus for electro-plating wire."—A communication to him from abroad by William Wallace, of Ansonia, in the county of New Haven and state of Connecticut, United States of America, Manufacturer.—Dated 14th March, 1877.

1027. **AMEDEE COMBAULT**, of 24, Broad Street, Golden Square, in the county of Middlesex, Jeweller, for an invention of "A new method of fixing buttons."—Dated 15th March, 1877.

1094. **ARTHUR CHARLES HENDERSON**, of 6, Southampton Buildings, Holborn, in the county of Middlesex, Patent Agent, for an invention of "Improvements in the application of alarms to watches."—A communication to him from abroad by Frederick Dessert, Watchmaker, a person resident at Besançon, in the department of Doubs, in the republic of France.—Dated 19th March, 1877.

1122. **GEORGE BLUNT**, of 24, Augusta Street, Birmingham, in the county of Warwick, Jeweller, for an invention of "An improvement in fastenings for solitaire sleeve studs, and other articles of a similar kind."—Dated 31st March, 1877.

Grants of Provisional Protection for Six Months.

530. To **WILLIAM ROBERT LAKE**, of the firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for the invention of "Improvements relating to the working, regulating, and winding-up of clocks, chiefly designed for controlling a series of clocks by pneumatic power."—A communication to him from abroad by Victor Popp, Ernest Resch, and Charles Albert Mayrhofer, as representatives of the "Gesellschaft zum Betriebe pneumatischer Uhren," of Vienna, Austria.

610. To **THOMAS TONKS**, the younger, of Birmingham, in the county of Warwick, Button Manufacturer, for the invention of "An improved link for cuffs, gloves, or other articles of dress."

661. To **JAMES CHISHOLM**, of Edinburgh, in the county of Midlothian, North Britain, for the invention of "An improved combined brooch and chatelaine."

4906. To **EZRA HATTON**, of Alexandra Street, in the city of Manchester, Ornamental Metal Worker, for the invention of "A new optical instrument for producing designs and for other purposes."

296. To **JOHN THOMAS NICHOLLS**, of Southampton Buildings, Holborn, for the invention of "Improvements in watch-guards or protectors."

646. To **CHARLES HASELER**, of Aston, near Birmingham, in the county of Warwick, Watch Maker, for the invention of "An improvement or improvements in watches and other time-keepers."

718. To **HENRY ANGELO LUDOVICO NEGRETTI and JOSEPH WARREN ZAMBRA**, both of Holborn Viaduct, in the city of London, Meteorological Instrument Makers, for the invention of "Improvements in Thermometers and hygrometers."

753. To **ISAAC GRINDROD**, Watch Maker and Jeweller, 33, Toad Lane, Rochdale, in the county of Lancaster, for the invention of "An improved solitaire or sleeve stud or fastening for wearing apparel."

Notices to Proceed.

4261. **WILLIAM WIGGINS**, of Stanmore Street, Caledonian Road, London, Goldsmith, has given notice in respect of the invention of "Improvements in the manufacture of watches to prevent robbery by breaking the bows thereof."

296. **JOHN THOMAS NICHOLLS**, of Southampton Buildings, Holborn, has given notice in respect of the invention of "Improvements in watch-guards or protectors."

348. **WILLIAM THOMAS KERRY**, of 10, Sotherton Road, King's Road, Fulham, in the county of Middlesex, has given notice in respect of the invention of "A new or improved polish for cleaning, reviving, and renovating jewellery, plated ware, furniture, and other such like articles."

4447. **ALEXANDER LESLIE FYFE**, of Aldersgate Street, in the city of London, has given notice in respect of the invention of "Improvements in shirt studs and dress fastenings."

419. **ALFRED VINCENT NEWTON**, of the office for Patents, 66, Chancery Lane, in the county of Middlesex, Mechanical Draughtsman, has given notice in respect of the invention of "An improvement in watch movements."—A communication to him from abroad by the Elgin National Watch Company (Incorporated), of the city and state of New York.

Patents which have become Void.

746. THOMAS KENDRICK, of Birmingham, in the county of Warwick, for an invention of "Improvements in fastenings for sbirt studs, sleeve links, solitaires, and other articles of jewellery and dress."—Dated 28th February, 1874.
784. JOSEPH GEORGE ROLLASON and JOHN WOOD, both of Birmingham, in the county of Warwick, Manufacturers, for an invention of "Certain improvements in the manufacture of ornamental metallic chains for fancy wear."—Dated 4th March, 1874.
842. JOHN COLLIS BROWNE, of 15, Nelson Crescent, Ramsgate, in the county of Kent, Physician, for an invention of "Improved means of and appliances for moving or setting and regulating one or more clocks, dials, or other indicators, by a standard time-keeper."—Partly a communication to him from abroad by Robert Herbert, of Dresden, in the kingdom of Saxony, and partly invented by himself."—Dated 7th March, 1874.
727. JESSE SINDONS, of West Bromwich, in the county of Stafford, Iron Founder, and DAVIN BOWEN MEESE, of Sedgley, in the county of Stafford, Agent, for an invention of "Improvements in clocks."—Dated 11th March, 1870.

Patents Sealed.

4539. EDWARD ARCHER WILDE, of 15, Ladbroke Gardens, Notting Hill, in the county of Middlesex, for an invention of "Improvements in obtaining alluminium and aluminium alloys."—Dated 22nd November, 1876.
3777. THOMAS HARE, of Birmingham, in the county of Warwick, Merchant's Clerk, for an invention of "New or improved apparatus for holding or suspending ladies' dresses."—Dated 28th September, 1876.
74. WILLIAM EDWARD GEDGE, of 11, Wellington Street, Strand, in the county of Middlesex, Patent Agent, for an invention of "Certain improvements in watch case springs."—A communication to him from abroad by Joseph Britton, of San Francisco, California, in the United States of America, Gentleman.—Dated 8th January, 1877.
88. ROBERT MANN LOWNE, of East End, Finchley, in the county of Middlesex, for an invention of "Improvements in barometers."—Dated 9th January, 1877.

Patents Granted in British Colonies and Dependencies.

NEW SOUTH WALES.

23. ALEXANDER HEATHERINGTON, for an invention of "An improved apparatus for separating metals, ores, or precious stones from earth or other impurities."—Dated 17th July, 1876.

Patents Granted in Foreign States.

FRANCE.

- 115,054. CHAUVIN, for "Rings for jewelry."—Dated 16th October, 1876.
- 115,086. DESHAYES, of Paris, for "Manufacturing musical toy-watches."—Dated 19th October, 1876.
- 115,113. DE ARCE Y NUNEZ, for "A geographical, astronomical, and cosmographical apparatus."—Dated 20th October, 1876.
- 115,128. GRASON, for "An improved self-locking shirt stud, applicable also for other fastening purposes."—Dated 20th October, 1876.—(English Patent, 17th October, 1876.)
- 115,129. HIRSCH, for "A clasp for ear-rings."—Dated 20th October, 1876.
- 115,154. MRS. DOMON, for "A Swiss watch."—Dated 23rd October, 1876.
- 115,168. LIFFMANN, of Besançon, for "A spring and ring for superseding stops in watch-springs and spring-boxes."—Dated 28th October, 1876.
- 115,243. VEISSIERE, for "Improvements in opera-glasses with interior adjustment."—Dated 27th October, 1876.
- 115,252. CARPANO and BENOIT, of Cluses, for "An indicator of the tension of springs in watches and clocks."—Dated 4th October, 1876.
- 115,323. DURIER, of Lillebonne, for "Watch-buttons."—Dated 4th November, 1876.
- 115,358. ENDRES, of Paris, for "Applying electricity to jewellery."—Dated 7th November, 1876.
- 115,377. SUISSE, of Nancy, for "A watch-remontoir and barrel, with a ratch on the lid."—Dated 13th November, 1876.
- 115,378. VAN BLOTAQUE, for "Sheaths with velveted glass rods for show-cases of jewellers."—Dated 7th November, 1876.
- 115,415. BONNOT and PORTET, of Dijon, for "A silver powder for silvering or re-silvering Ruolz and plated articles, &c."—Dated 15th November, 1876.
- 115,451. DE COMBETTES, of Paris, for "A clock-bell."—Dated 11th November, 1876.
- 115,465. LACOSTE, for "A toy-watch applicable as a time-indicator."—Dated 11th November, 1876.

AUSTRIA.

53. A. JAGER, of Gablonz, for "Improvements in the manufacture of studs."—1 year.—(Secret.)—Dated 7th October, 1876.
131. M. WERTHEIMER, of Vienna, for "Manufacturing metal frames with fine and durable gold lustre."—1 year.—(Secret.)—Dated 6th October, 1876.

BELGIUM.

- 41,495. GUYE and BARBEZAT, for an imported invention of "A calendar-watch."—Dated 12th February, 1877.—(French Patent, 7th December, 1876).
- 41,497. THE PNEUMATIC CLOCK COMPANY, for an imported invention of "Pneumatic clocks."—Dated 13th February, 1877.—(French Patent, 10th February, 1876.)
- 41,516. D. J. GEYER, for "Improvements in studs of wristbands."—Dated 14th February, 1877.
- 41,518. C. FLUGEL, for "Improvements in clocks of turrets and railway stations."—Dated 14th February, 1877.
- 41,536. H. ROSIERS, of Schaerbeek, for "An alarm-indicator."—Dated 17th February, 1877.

Designs Patented in the United States.

9362. LUCIUS L. CULVER, WILLIAM W. CULVER, and HENRY H. CULVER, of St. Louis, Mo., for "Clock cases."—Application filed 24th June, 1876.—Term of patent $3\frac{1}{2}$ years.

MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Distribution of Assets.

STACEY, EDWARD H., Sheffield, Yorkshire, silver plater, died December, 20. Claims by April 26, to A. Taylor, Sheffield, Sol.

Applications for Cessio-Bonorum in Scotland.

M'LAY, JAMES, 272, Buchanan Street, previous 58, College Street and 18, North Albion Street, all Glasgow, presently in Glasgow prison.

Dissolutions of Partnerships.

BARNETT, BROS. Vittoria Street, Birmingham. Debts by Samuel Barnett.

CHAPLIN & SONS, 25, Aldersgate Street, jewellers, manufacturers, and importers. January 31. As regards James H. Chaplin.

DRESCHER & SON, Clarence Street, Kingston, clock and watchmakers. January 1. As regards Kaspar Drescher.

SMITH and GRANT, Lower Bridge Street, Dublin. Debts by Edward Smith.

CORBETT & Co., Glasgow, watchmakers, &c. Debts by A. B. Anderson.

BOWEN, T. & G., 29, Summer-row Birmingham, Platers & Manufacturers of Silver & Plated Goods. March 21. Debts by Jonas Bowen.

Scotch Sequestrations.

SUTHERLAND, BROS., 253, Argyle Street, Glasgow, wholesale jewellers and dealers in electro plate, as a company, and William Russell Sutherland, Milton of Campsie, and James Linton Pairman, Kirk road, Wishaw, the sole partners thereof, as such and as individuals. February 28, with protection. Tr. and Com., Faculty Hall, Glasgow. Claims by June 28. Agents, Wright and Johnston, Edinburgh, sols.

Dividends.

DOVEY, JOHN (liq.), Salford, Lancashire, and Altrincham, Cheshire, art metal worker. 1st and final div. 3/4; W. P. Kershaw, at J. E. and R. Whitworth's, solicitors, St. James' square, Manchester.

HUGHES, JOHN, 26, Great Hamilton Street, Glasgow, watchmaker, &c. 1st. Brown, jun., Davies & Tait's, 65, West Regent Street, Glasgow.

JACOB, AARON, 63, Renfield road, Glasgow, jeweller, &c. 1st and final, Reid & Mair's, 40, St. Vincent place, Glasgow.

BARFOOT, CORNELIUS HENRY, (liq.) Huntingdon, watch and clock maker. Div. 4/0 Benjamin Taylor, Souvenir House, Peterborough.

Liquidations by Arrangement or Composition.

EDWARDS, WILLIAM H., Market Street, Birkenhead, watchmaker, February, 28. T. M. Downham, solicitor, Birkenhead.

LOMAS, JOEL, New Mills, Derbyshire, jeweller. February 27. J. Best, solicitor, 64, Lower King street, Manchester.

PUMFREY, JOHN HILLMAN, Northampton Street, Birmingham, jeweller. February 28. Tyndall & Tyndall, sols., 34, Waterloo street, Birmingham.

STANLEY, THOMAS, 2, Court, Bayley-Lane, Coventry, watch manufacturer. February 22. Hughes & Master, solicitors, Coventry.

GRIME, JAMES, Fishergate, Preston, jeweller. March 15. J. C. Ambler, sol., Preston.

Meetings.

RANDLYFFE, ALFRED HENRY & WILLIAM, of No 188, High Street, Camden Town, jewellers. At Guildhall Tavern Gresham Street, April 10th, at 2 p.m.

CUNNINGHAM, ROBERT WILLIAM, of No 74, Cross Street, Manchester, Watchmaker and Jeweller. At Messrs. Horner & Son, Sol. 3, Clarence Street, Manchester, April 17th at 3 p.m.

THE WATCHMAKER, JEWELLER, SILVERSMITH, AND KINDRED TRADES' DIRECTORY.

The important feature of our Directory Columns will be found to be a most effectual method of keeping the Names of Firms and Manufacturers before the constant notice of the Trade.

No Charge is made for Insertion of a Two-line Entry of Name and Address of Firms whose advertisements, occupying not less than one-third of a page, appear for twelve consecutive months. In other instances, the Charge for the Two-line Entry of Name and Address is £1 ls. per annum; four lines, £1 10s. per annum; six lines, £2 2s. per annum. No Charge is made for the heading or title under which any entry appears.

AMERICAN (WALTHAM) WATCHES.

FATTORINI & SONS (Wholesale Factors) Watch and Chronometer Manufacturers, Bradford, Yorkshire.

BAROMETER AND THERMOMETER MAKERS.

MURRAY & CALLIEU, 22, St. John's Square, E.C.
NEGRETTE & ZAMBRA, Holborn Viaduct, E.C.; Charterhouse Street, E.C.; 45, Cornhill, E.C.; 122, Regent St. W.
WEBSTER, J., 88, St. John Street Road, Clerkenwell, E.C.

BURGLAR AND FIRE PROOF SAFE MAKERS.

CHATWOOD'S, 120, Cannon Street, E.C., and Lancashire Safe and Lock Works, Bolton.
GEERING & TALBOT, Apollo Safe Works, Moseley Street, Birmingham.
PHILLIPS & SON, Speedwell Works, Sherborne Street, Birmingham.
THE SICKER SAFE AND STRONG ROOM COMPANY, LIMITED, Soho, near Birmingham.
WHITFIELD (F.) & CO. Whitfield's Patent Screw Bolt and other Safes, Viaduct Works, Oxford Street, Birmingham.

CLOCK IMPORTERS.

MAYER A. & SON, 122a, Aldersgate Street, London, E.C. Importers of American, French, German, and Cuckoo Clocks, Materials, &c.

CLOCK MAKERS.

BRUGGER & STRAUB, 79, High Holborn, W.C.
CAMERER, KUSS, FRITSCHLER, & CO., 522, Oxford Street, W.C., and 2, Broad Street, Bloomsbury, W.C.
COHEN (JACOB) & CO., 36 and 37, Ely Place, E.C., and Charterhouse Street, E.C., London; and 10, Rue Béranget, Paris.
GILLET & BLAND, Steam Clock Factory, White Horse Road, Croydon. Exhibition Medal, 1873. Makers (to her Majesty's Government) of Worcester Cathedral Chimes at Bradford and Rochdale Town Halls, Boston, St. Stephen's Church, Hampstead, &c.; and of Clocks of every description; also patent Carillon Machines. Sole Proprietors and Makers of Patent No. 4141, for improvements in Church and other Bell Music. Established 1844.
GREENWOOD (JOHN) & SONS, Importers and Manufacturers of Clocks and Watches. Wholesale and for Exportation. Farringdon Road, near Clerkenwell Green, London, E.C.
SWINDEN & SONS, 27, 28 & 29, Temple Street, Birmingham.

DIAMOND MERCHANTS.

JONAS BROTHERS, 34, Ely Place, Holborn, London, E.C.
MARCUS (MAURICE) & CO., Waterloo House, Holborn Viaduct, London, E.C.
RUTHERFORD, JAMES, 2, Wilderness Row, E.C., and 33, Kirby Street, Hatton Garden, London, E.C.
WIGGEL, B., Jun., Diamond Merchant and Jeweller, 27, Wilmington Square, Clerkenwell. Diamonds and precious stones mounted or reset to the best advantage. Country Orders punctually attended to.

GILT JEWELLERS.

CARLOSS (W. J.) & KING, 66, Hatton Garden, London, E.C. Manufacturers of Gilt Head Ornaments, Coronets and Combs, Jewelled Gilt Table Ornaments, Flower Vases, Inkstands, Prize Cups, and Ornamental Metal Work.
HUTTON & CO., 5 and 6, Newgate Street, E.C., and Phoenix Court, Newgate Street, London, E.C.

JET ORNAMENT MANUFACTURERS.

BLUMBERG & CO., 2, Cannon Street, London, E.C.
JONES, A. EDWARD, 93, Hatton Garden, London, E.C.
LITTEN (T. R.), 64, Hatton Garden, London, E.C.
WILLIAMSON, HENRY, 85, Old Street, St. Luke's, London, E.C.

JEWELLER'S MATERIALS.

CLEMENTS, HANDLEY & Co., Dealers in all kinds of Tools and Materials, Stones, Pastes, Cases, &c., 19, St. John's Square, Clerkenwell, E.C. (See advertisement).
KING, J. W., Dealer in all kinds of Jeweller's Materials, Stones, Pastes, Locket Glasses, &c., 15, St. John's Square, Clerkenwell, E.C.

JEWELLER'S SHOP FITTERS AND SHOW CASE MAKERS.

JEFFREYS, CHARLES, 103, Hatton Garden, E.C. Estimates free.
SAGE, FREDERICK, Steam Works, Commercial Buildings, 80 to 84, Gray's Inn Road, W.C. Large stock on view.

JEWELLERY CASE MAKERS.

EDWARDS, JOHN, 26, St. John Street Road, London, E.C.
JEFFREYS, CHARLES, Jewellery Case, and Velvet Stand Manufacturer. The largest stock in England. 103, Hatton Garden, E.C.
SAGE, FREDERICK, Steam Works, Commercial Buildings, 80 to 84, Gray's Inn Road, W.C. Large stock on view.

MANUFACTURING WHOLESALE JEWELLERS.

JOSEPH, B. H. & Co., 20, Frederick Street, Birmingham, Manufacturers of the Registered "Standard" Sizes for jewellers.
HUMPHREYS (JOHN A.), 23, Wilderness Row, Clerkenwell, E.C., Jewellery, Chains, Wedding Rings and Keepers, &c.
LAWSON (P.) & GODDARD (C. GILBERT), Manufacturing Goldsmiths, Wholesale Jewellers, Clock and Bronze Importers, Dealers in Precious Stones, and also English, American, and Geneva Watches, 5, Hatton Garden, London, E.C.
BASNETT, S., 29, Augusta Street, Birmingham, Manufacturer of Coloured Gold, Jewellery, Sets, Brooches, Earrings, Pendants, Bracelets, Pins, Crosses, Slides, &c.
MYERS, N. A., 2, St. Patrick Square, Edinburgh, Importer of French, American, and German Clocks, Watches, Materials, &c.

MUSICAL BOXES.

GREENWOOD (JOHN) & SONS, Importers and Manufacturers of Clocks and Watches. Wholesale and for Exportation. Farringdon Road, near Clerkenwell Green, London, E.C.
ADANK, J. JACQUES & Co., Manufacturers of Musical Boxes. Prize medal at Philadelphia. St. Croix, Switzerland.

OPTICIANS.

COHEN (JACOB) & CO., 36 and 37, Ely Place, E.C.; and Charterhouse Street, E.C., London; and 10, Rue Branger, Paris.

SILVER CHAIN MANUFACTURER.

PHILLIPS HENRY, Manufacturer of Silver Guard and Albert Chains, Seal Keys, Bracelets, Necklets, &c., 24, Great Hampton Street, Birmingham.

SPECTACLE AND EYEGLASS MANUFACTURERS.

LAWRENCE, N., 17, Holborn Hill, London, E.C.; Manufactory, Havelock Works, Walker Street, Sheffield.
LAZARUS (S. J.) & CO., Manufacturers of Spectacles and Eye Glasses, and every description of Optical Goods, 129, London Wall, E.C.

TURRET AND RAILWAY CLOCK MAKERS.

MILLAR, H. & R., Castle Bank Works, Edinburgh. Turret, Quarter, Chime, and Railway Clocks, 20 per cent cheaper than other makers. The only steam power factory in Scotland. Photographs. Established 1840.

WATCH DIAL PLATE MAKER.

WILLIS, THOMAS J., 10, Rydon Crescent, St. John Street Road, London, E.C.

WATCH BALANCE MAKER

COLLIS S. HASTINGS, 37, Whiskin Street, London, E.C.

WATCH CAP MAKER.

BAKER, WILLIAM, 10, Meredith Street, Clerkenwell, London, E.C.

WATCH CASE MAKERS.

DUNN, HENRY, 48, Rahere Street, Goswell Road, London, E.C.
NEWMAN, JAMES THOMAS, 42, Spencer Street, Goswell Road, London, E.C.
STRAM, ALFRED, 12, Ashby Street, London, E.C.

WATCH MANUFACTURERS.

HARGREAVES (L) & CO., Wholesale Watch Manufacturers, 11, Slater Street, Liverpool.
HILL (THOMAS) & CO., 1, Hearsall Terrace, Coventry. Watches for Home and Export Trade.
MICHAEL, MAURICE, Full Plate, Three-quarter Plates, Centre Seconds, and Keyless Watches. For Home and Export. Norfolk Street, Coventry.
NEWSOME & YEOMANS, Wholesale Watch Manufacturers, Spon Street, Coventry. The performance of all our watches guaranteed for a number of years.
PENLINGTON & HUTTON, Chronometer and Watch Manufacturers, 2 and 3, St. George's Crescent, Liverpool.
SWINDEN & SONS, 27, 28 & 29, Temple Street, Birmingham.

WATCH AND CLOCK MATERIAL DEALERS.

BEDFORD, H. E., 12, Crown Street, Halifax.
COWEN, DAVID, 28, Withy Grove, Manchester.
MEREDITH (WILLIAM) & SON, 260, Goswell Road, London, E.C.
SAGGERSON, ROBERT, Wheel Cutter and Dealer in Watch Materials, Files, Tools, &c., Prescott, Lancashire.
SWINDEN & SONS, 27, 28 & 29, Temple Street, Birmingham.
THOMAS, WILLIAM, 7, Great Sutton Street, Clerkenwell, London, E.C.
THOMPSON (EDWARD JOHN) & VINE, 146, Goswell Road, London, E.C.

WEDDING RING MAKER.

ASTON, HENRY M., the original Wedding and Keeper Ring Manufacturer. An Extensive and varied stock always on hand. 12 Regent Place, Birmingham.

WORKING JEWELLERS.

CLEMENTS, HANDLEY & Co., 19, St. John's Square, Clerkenwell, E.C., all kinds of jewellery repaired on the shortest notice. Gilding, Plating, and Mounting for the Trade. (See advertisement).

JOHN ROBERT WILLIAMS & SON,
MANUFACTURING JEWELLERS AND GOLDSMITHS,
DEALERS IN DIAMONDS AND COLOURED STONES.

Warehouse: 108, Hatton Garden, E.C.

CHOICE BRILLIANT AND GEM RINGS. FINE SILVER-SET DIAMOND WORK. DIAMOND SUITES
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A Large and Choice Stock always on hand for selection.



A MONTHLY TRADE JOURNAL,

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HOROLOGY.

(Continued.)

XXIII.—A CHAPTER ON TIME.

WE concluded our last paper upon having shown what is the solar and what is the sidereal day, alluding, also, to the "Equation of Time," and the civil, or day of every day life. Before we deal with the more complicated equation, perhaps, it will be as well to dispose of the third kind of day, so that the reader may have them all before him without a break.

The last-named day is again divided into the artificial and the natural; the former we look upon as consisting of the duration of actual daylight, such as long days, short days, &c., whilst the natural belongs to one of the solar definitions mentioned before. Furthermore, an explanation of days will necessarily involve one of chronology, which is neither more nor less than The Story of Time, and will have to be dealt with in its turn.

We can readily believe that the early division of the day was of the most primitive and roughly defined character. We have shown in our articles on dialling that, until mechanism came into operation, morning, noon, and night were the measuring points from which all sub-divisions started. How many ages must have passed into the ever-receiving gulf of Nothingness, before the advent of even the marking of the shadow; and, again, we all know, now, the long centuries that intervened from that period to the discovery of the pendulum! And yet, when we think for a moment about it, how simple it all seems, and how strange that it was not all discovered ages and ages ago! Yet, notwithstanding the discovery and application of the water-clock, the hours were not of equal length; this

error arose partly from the defect inherent in the instrument, and partly from the imperfect method of working it. It appears from what we can learn, that the day, whether long or short, was divided into twelve parts. This arrangement, in the long days of summer, made each hour consist of more than 70 minutes, whilst in winter a compensation was made in hours of only 50 minutes. Again, the latitudes of various places would somewhat modify this method which would be still further interfered with by whether the day began at the visible sunrise, or with the first appearance of the dawning light in the east of the place.

Ancient history tells us that different nations began their day in different ways. Thus, the Babylonians, Persians, Syrians, and other Eastern nations began their day with the rising of the sun; but the Athenians, the Jews, and several others began it with the sun's setting, whilst the Umbri and Arabians fixed upon noon, as the modern astronomers have done, and the Egyptians fixed upon midnight.

The civil day of the Romans was from midnight to midnight, the natural day being from the rising to the setting of the sun; following the natural day there came the natural night, both of which were amply sub-divided. The civil day was broken up into sixteen portions, all having appropriate names. These were midnight, past midnight, cock-crow, cock-crow over, the dawn, the morning, the forenoon, mid-day, afternoon, sunset, evening, twilight, bed-time, silent night, and inclining to midnight. The divisions of the natural day were arranged according to the season of the year, whilst the night had another division of watches. Until sun-dials came into use at Rome there were no such periods as "hours" known; afterwards, the day had twelve, and the night had twelve. A meridian was fixed on the rostrum of the Senate-house from which an officer called out mid-day when the sun arrived there. The night

watches were composed of three hours each; there were four such watches, each being announced by the sound of a trumpet, the private watchman calling out the hours. We find the same practice much earlier than the days of Rome; thus in Isaiah:—"My lord, I stand continually upon the watch-tower in the daytime, and I am set in my ward whole nights." Again—"He called to me out of Seir, 'Watchman, what of the night?'"

The watchman said, "The morning cometh and also the night, if ye will enquire, enquire ye: return, come."

The beginning of our day at midnight dates from a remote period; when, is not exactly known. As it agrees with the ancient Roman method, the balance of probabilities are, that the Romans brought it and established it in Britain. Another account, however, puts it down as an ecclesiastical invention resting upon the following ground: Many of the Church festivals—when the Church was all-powerful in temporal affairs—were protracted far into the night, whilst others began very early; it seemed consequently to the "authorities" that the midnight hour was the best and most convenient time to separate one day from another. That influence being therefore paramount throughout the land, the other public institutions would be obliged to fall into the same way. Although this division prevailed over nearly the whole Christian world, it seems somewhat curious that Italy, the very seat of ecclesiastical power, did not fix its legal time at midnight.

The mode by which the Italians compute the day is considerably different from ourselves, as well as from several other countries. We have been told that, officially, it has become assimilated to that of the rest of Europe, but, among the great mass of people the old plan still prevails. There are public time-keepers in Rome, Florence, Milan, and all the large towns, which are set to go the same way as in both France and England, but the hours of the country people are very different to clock hours. Instead of being based upon the mean time meridian, the Italians go by sun-set, which is never the same through all parts of the country, the latitudes, of course, changing it. But wherever an Italian may happen to be at the time, he considers his day ended half-an-hour after sunset. He does not divide his day into two portions of twelve hours as we do, but runs on to twenty-four o'clock. To put it in this way, one o'clock is an hour and a half after sunset, two o'clock two hours and a half after sunset, three o'clock three hours and a half after sunset, and so on until sunset comes round again. And yet for daily use they say that their mode is better than ours; because, as the end always points towards sunset, it enables them, being used to it, to know how much daylight is left on their hands. No doubt this counting has its conveniences in a country where moving about at night is both difficult and dangerous; otherwise, it is as nearly useless as possible. In order, therefore, to ascertain when this Italian day commences, add half-an-hour to the time of sunset whatever period of the year it may be, and the product will be what is required. We cannot say that we are at all enamoured of the Italian time-keeping; it changes as the traveller changes, and as the seasons change. Therefore the only safe guide to all this puzzling is to procure as you move along tables of sunset for the principal cities and months of the year, and consult them when you desire to know what (Italian) o'clock it is.

The next system to which we have to allude is the Mahometan. The division of the day among them is governed by the times of performing their devotions. Like some of the nations already mentioned they commence with sunset, and go on until sunrise without any reference to the fact whether the day be long or short. They have also twelve hours from sunrise to sunset, from which arises the curiosity of very long night hours in winter and very short ones in summer. It will be readily understood from this, that such hours can only approach equality at the equinoctial points of the year; at which time, too, they agree with us and several other states of Europe. Like the Italians, as well, a table is wanted by the stranger to obtain mean time. Thus the difference will run to as much as six hours, making their six o'clock our twelve, and *vice versa*; what has to be ascertained in computation are the periods of sunrise and sunset, and divided by twelve, the number of Mahometan hours, and then compare with the time belonging to the meridian of the place. Let it be supposed that the sun rises at seven o'clock and sets at five o'clock, as he does in the latter part of February, then rejecting odd minutes at both ends, there will be a mean-time day of ten hours of sixty minutes to the hour; the Mahometan day will still be twelve hours, but having only *fifty* minutes to the hour. Again, one o'clock of that reckoning will be at fifty minutes passed seven of ours; two o'clock forty minutes passed eight; three o'clock will be half-past nine, and so on until the whole twelve hours have been exhausted. Take the sun to rise at five o'clock, which occurs about the middle of April, and we run on with the

Mahometan time for about three hours. Then we shall have of that time, ten minutes past six for our six, twenty minutes past seven for our seven, and half-past eight for our eight. The Mahometan time, however, is so contrived that when worked through, six o'clock always agrees with our noon, which confirms what has previously been stated about a difference of six hours in the day occurring between the Mahometans and ourselves. As many of the time-keepers are made in this country for the Mahometan populations, those engaged in such manufacture, especially the dial-writers, will now be able to form some satisfactory notion of the meaning of the hieroglyphics which they are called upon to produce.

Looking at this subject as far as we have gone, what seems to us as the oddity of it is the peculiar division of one day from another. Whether our present method was the result of ecclesiastical convenience, or otherwise, there can be little doubt but that it is the most natural one for the civil day. Nothing would be more strained and difficult for us here in England than, when sitting down to tea, as it were, on Sunday afternoon, and watching the sun sinking below our horizon, to believe that Monday morning had begun! On the other hand, what can be more natural than for our day's work to be completed, and we retired to rest, to have the day complete itself, also, in that interval that occurs between our sleeping and waking. To our minds the great wonder is that all the nations of the earth have not, ages ago, hit upon so simple and natural a plan. The derivation of the word Hour, itself, has been subject to some etymological research. Of course, we are most of us aware by this time that the term came to us through the Latin, and to the Latin from the Greek; but we have not asked whether it was coined by the Greeks, or adopted by them from some other language. Some ancient philologists have affirmed that it was derived from a surname of the sun, the father of hours, whom the Egyptians called *Horus*. Well, *horus* and *hora* are very like one another, and the derivation seems probable enough. But there are writers who derive the word from the Greek *horisein*, to terminate, to distinguish—much the same meaning as the ordinary word horizon, only applied to time instead of to the boundary of landscape view. It was hardly to be expected that in a matter of this kind the mythologists would consent to be shut out; accordingly, we find them stoutly maintaining that it was the natural peculiarities of an animal consecrated to the Egyptian deity Serapis, as exhibited twelve times in the day, and twelve times in the night, that first fixed the division of diurnal time into hours. Be this as it may, such division is, no doubt, very ancient, and the most ancient form is that of twelve hours for the day, and twelve for the night. We have it on the authority of Herodotus, that the Greeks learnt the method of such arrangement from the Egyptians.

The twenty-four hour system was not known to the Romans before that era of theirs called the First Punic war, or about two hundred and sixty-five years before the commencement of the Christian era. Previous to that time their days were regulated by the rising and setting of the sun. We have already alluded to their night-watches. Midnight with them was called the sixth hour of the night. One o'clock in the morning, the seventh hour, two o'clock, the eighth hour, &c.

The information collected here belongs to the history of time-keeping among the nations. It is collected from a variety of sources, such as we presume the ordinary readers of this journal not to have at their command. To the true historical student it must prove of the utmost interest, as it enables him to learn how the world marked the minutes before modern invention dawned upon mankind—and how some people mark them still.

CURIOUS CLOCK.

EVELYN, in his "Memoirs," mentions his having seen a curious mechanical contrivance. "I was showed a table clock, whose balance was only a crystal ball, sliding on parallel irons, without being at all fixed, but rolling from stage to stage, till it was thrown up to the utmost declivity; in the constant vicissitudes of motion, prettily entertaining the eye every half minute; and the next half minute guiding progressively the hand that showed the hour, and giving notice by a small bell, so as in 120 half minutes or periods of the bullets falling on the ejaculatory spring, the clock part struck. This very extraordinary piece (richly adorned) had been presented by some German prince to our late King (Charles I.), and was now in the possession of the Usurper (Oliver Cromwell); it was valued at 200l."

ON A NEW METHOD OF MOUNTING MICROSCOPICAL OBJECTS.*

By PROF. H. L. SMITH, Hobart College, N.Y.

I HAVE noticed so many inquiries lately as to the best mode of mounting objects requiring a cell of moderate depth, and often the use of a fluid, that I am induced to give a short description of my own method, both for Diatomaceæ and for Foraminifera. For the latter I punch, out of a sheet of wax (dark green or black), a disc a trifle larger than the brass curtain-ring which is to constitute the wall of the cell. This disc is pressed by one edge to the centre of a glass slide, and slowly warmed till it melts—if well done no bubble of air is inclosed under it, and the whole cools with a smooth, somewhat dead surface. The ring is then pressed into this, and centred by the turn-table, and then again pressed fully home, showing the brass, when looked at from the other side; and the whole finished with the usual "Brunswick black" outside, and also the ring inside. To attach the Foraminifera, or other objects, a minute drop of turpentine is applied to the wax, and in a minute or so, before it is quite dry (and we may proceed leisurely), the object is placed on the softened wax; when thoroughly dry, it will be found so strongly attached that a violent blow or a fall will not dislodge it. Of course, if the object is very large, the turpentine may have a little of the Brunswick black, or some size dissolved in it. The improvement over the glistening gum attachment for minute objects is very manifest—indeed no signs of the cementing material show if the turpentine is judiciously used. While all this is being done, the Brunswick black on the brass ring will have set sufficiently to fasten the cover, which should be of such a size as to rest, not on the top of the ring, but to slip just within, so that its surface will be flush with the top of the ring. When the cover is pressed home, the whole may at once, without any danger of its "running in," be finished with the black varnish. Nothing can exceed the soft and delicate appearance of these wax backgrounds, nor can a cell be built up in any manner more readily. I use the sheets prepared for wax flowers, and of course colours may be selected to suit the object. The discs are punched by a solid plunger, which must frequently be cleaned by punching discs from a thick card either oiled or prepared with a little turpentine. Care will enable one to prepare these rapidly. The thin cells for large Diatoms, &c., to be mounted dry, I make as follows:—The wax disc—in this case say bright red—is put under another press, and the centre punched out, leaving a ring of wax. With my own press I do this readily, and I will try to describe, as well as I can without a figure, the operation. Concentric with the hole that receives the plunger to force out the centre of the wax disc is a larger hole (the same size as the wax disc) in a brass plate, the plate being a trifle thicker than the wax disc; this plate is, say, two inches long, and can be turned aside from over the hole in the bed plate of the press, on a screw, or pin, inserted near one end. Above this brass plate is another turning on the same pin, but having a hole only just the size of the solid plunger. The operation is as follows:—The lower brass plate is brought into place, its hole concentric with the hole in the bed plate (this is determined by a limiting pin inserted in the bed plate); the wax disc, wetted in the mouth, is now dropped in, and the upper plate swung round over it, the hole in the latter of course coming into place against the limiting pin so as to receive the plunger. When the plunger is forced down, a ring of wax is left on the bed plate, and on swinging round the lower brass plate this ring drops out free. The only precaution is to keep the wax from sticking to the edges of the plunger and of the die (simple wetting will answer probably, and will enable one to make these rings very nicely); if they are used, the steel plunger must afterwards be dried and oiled. And then the rings are made. We place one on the centre of a slide, putting upon it a piece of oiled paper (so dry as not to leave marks on the slide); press the wax forcibly on to the glass, and burnish it with the nail, or an ivory handle, not so hard, however, as to press it out of shape. The object is now put in the cell (or, if Diatoms, mounted on the cover), and the cover applied—it should be the same size as the ring, and may be held in place by one of the ordinary spring clips; next, by means of a pin's head (the pin mounted in a handle), or by a wire used as a soldering tool, by heating in the flame of a lamp, and which is applied on the top of the cover at the margin; the wax is melted (only under the margin of the cover, however), thus fastening the cover securely—the different colour of the melted and attached wax shows when this is completely done. The whole may now receive immediately a finish of any of the ordinary varnishes, and with no fears of running in. If the wax ring is neatly made, and soldered to the cover (if I may be allowed

the expression), a minute ring of it—red, or blue, or white—may remain as a finish, or the whole may be covered with the black varnish. I find the coloured wax works somewhat better in punching than the bleached or white. For mounting Foraminifera the wax bottom cell cannot be surpassed; indeed, no one who has used it will return to paper or any other substitute.

GIGANTIC SILVER FOUNTAIN.

THE manufacture of large works in silver is not confined to countries in which that metal is most abundantly found. True that we read of a kitchen in South America being furnished with all sorts of kitchen utensils made of silver, and even a drinking trough for horses at an inn being entirely of that metal; but these works exhibit no specimens of taste in form, and possess all the clumsiness of rude art. In England we have produced a work alike remarkable for its stupendous size and ornamental design, which is believed to be the largest "piece of plate" ever executed in this country. It originated as follows. The Court of Directors of the East India Company, being anxious to acknowledge the friendly deportment of the Pacha of Egypt towards our country, "in a manner worthy of the greatest political and military power in the East," had constructed a silver fountain, of extraordinary magnitude and exquisite workmanship, as a present to Mohammed Ali, from the Company.

This truly magnificent fountain is upwards of 10 feet high, and contains 10,000 ounces (about 7½ cwt.) of silver. The base is of a quadrangular form, resting on a slab of black marble. It is 4 feet in diameter, and terminates in fluted claws, presenting altogether the appearance of a massive and enriched pedestal. In the centre rises a sort of altar, or column, also quadrangular, whence rises a shaft, containing the first and largest of the basins; within and around the edges undulates a wreath of oak leaves and acorns, twined and banded together with excellent effect, the overhanging portions being characteristically festal. The design of the two upper basins is of corresponding character, as is also the ornamental shaft. At each of the four corners of the basement is placed a vase of elegant design, containing a bouquet of flowers in frosted silver; and falling from the scrolls of the upper table, or altar, towards these vases, are cornucopiæ, filled with fruit and flowers. Their execution is very beautiful, and artistically accurate.

The interior works are as follows:—From the top, water is thrown by a jet worked by machinery, consisting of a force pump, and a weighted plunger, working in an air-tight vessel; and the water, being thus thrown up, falls into the three successive basins in the form of the pyramid, and returns through the centre of the lowermost basin into the reservoir, whence it is again taken up and used, on the pump being set in motion.

It will play for nearly two hours, after being pumped for six or seven minutes, by means of a handle inserted in one corner of the base.

The style of the ornament throughout the exterior of the fountain is that of Louis Quatorze. On the sides of the base is a convex shield, bearing the following inscription, in four languages,

TO HIS HIGHNESS
MOHAMMED ALI,
Pacha of Egypt;

PRESENTED BY

THE EAST INDIA COMPANY.
LONDON, A.D. 1845.

The other languages are Turkish, Arabic, and Latin. The cost of this magnificent fountain was 7000*l*. It occupied more than seven months in the actual manufacture, and is in every respect a superb piece of art.

DON J. MOZART, the unfortunate watch inventor, died at the county poor house, in Ann Arbor, Mich., U.S.A., on the 15th ult. He was once a well-to-do jeweller in that city, and a few years ago succeeded in inventing a watch which had such superior qualities that a stock company with a large capital was formed for its manufacture. Everything was in readiness for work, when, taking his model apart for some slight improvement, he seems to have been so overcome with his success, that his mind was weakened and he found himself unable to complete his invention. Soon after he became hopelessly crazy. His small fortune was lost, and his family left with nothing but a home. He was placed under the care of physicians at the Kalamazoo Insane Asylum, but could not be cured. The masonic fraternity have since provided for him in connection with the county.—*Jewellers' Circular*.

* From the *Journal of the Quekett Microscopical Club*.

OBSERVATORIES. From the "Orbs of Heaven."

AS our readers well know, an observatory is a structure fitted up expressly for astronomical observations, and furnished with suitable instruments for that purpose.

The two most celebrated observatories hitherto built are those of Tycho Brahe, and of Greenwich. The observatory of Tycho Brahe was constructed at the expense of the King of Denmark, in a style of royal magnificence, and cost no less than 200,000 crowns. It was situated on the island of Huenna at the entrance of the Baltic, and was called Uraniburg, or the palace of the skies.

Before giving an account of Tycho's observatory, it will be useful to relate a few particulars respecting this great astronomer himself.

Tycho Brahe was of Swedish descent and of noble family, but having received his education at the University of Copenhagen, and spent a large part of his life at Denmark, he is usually considered a Dane and quoted as a Danish astronomer. He was born in the year 1546. When he was about fourteen years old, there happened a great eclipse of the sun, which awakened in him a high interest, especially when he saw how accurately all the circumstances of it answered to the prediction with which he had before been made acquainted. He was immediately seized with an irresistible passion to acquire knowledge of the science which could so successfully lift the veil of futurity. His friends had destined him for the profession of law, and, from the superior talents of which he gave early promise, added to the advantage of powerful family connections, they had marked out for him a distinguished career in public life. They therefore endeavoured to discourage him from pursuing a path which they deemed so much less glorious, and vainly sought, by various means, to extinguish the zeal for astronomy which was kindled in his youthful bosom. Despising all the attractions of a Court, he contracted an alliance with a peasant girl, and in the peaceful retirement of domestic life desired no happier lot than to peruse the grand volume which the nocturnal heavens displayed to his enthusiastic imagination.

He soon established his fame as one of the greatest astronomers of the age, and monarchs did homage to his genius. The King of Denmark became his munificent patron, and James I., King of England, when he went to Denmark to complete his marriage with a Danish princess, passed eight days with Tycho in his observatory, and, at his departure, addressed to the astronomer a Latin ode, accompanied with a magnificent present. He gave him also his royal licence to print his works in England, and added to it the following complimentary letter:—"Nor am I acquainted with these things on the relation of others, or from a mere perusal of your works, but I have seen them with my own eyes, and heard them with my own ears, in your own residence at Uraniburg, during the various learned and agreeable conversations which I there held with you, which even now effect my mind to such a degree that it is difficult to decide whether I recollect them with greater pleasure or admiration." Admiring disciples also crowded to this sanctuary of the sciences to acquire a knowledge of the heavens.

The observatory consisted of a main building, which was square, each side being sixty-feet, and of large wings in the form of round towers. The whole was executed in a style of great magnificence; and Tycho, who was a nobleman by descent, gratified his taste for splendour and ornament by giving to every part of the structure an air of the most finished elegance. Nor were the instruments with which it was furnished less magnificent than the buildings. They were vastly larger than had before been employed in the survey of the heavens, and many of them were adorned with costly ornaments. One of Tycho's large and splendid instruments was his astronomical quadrant, on one side of which was figured a representation of the astronomer and his assistants in the midst of their instruments, and intently engaged in making and recording observations. The description of this instrument, furnished by his contemporaries, conveys to us a striking idea of the magnificence of his arrangements, and of the extent of his operations. Here Tycho sat in state, clad in the robes of nobility, and supported throughout his establishment the etiquette due to his rank. His observations were more numerous than all that had ever been made before, and they were carried to a degree of accuracy that is astonishing, when we consider that they were made without the use of the telescope, which was not yet invented. Tycho carried on his observations at Uraniburg for about twenty years, during which time he accumulated an immense store of accurate and valuable facts, which afforded the groundwork of the discovery of the great laws of the solar system established by Kepler.

But the high marks of distinction which Tycho enjoyed, not only from his own sovereign, but also from foreign potentates, provoked

the envy of the courtiers of his royal patron. They did not, indeed, venture to make their attacks upon him while his generous patron was living; but the king was no sooner dead, and succeeded by a young monarch, who did not feel the same interest in protecting and encouraging this great ornament of the kingdom, than his envious foes carried into execution their long meditated plot for his ruin. They represented to the young king that the treasury was exhausted, and that it was necessary to retrench a number of pensions which had been granted for useless purposes, and in particular that of Tycho, which, they maintained, ought to be conferred upon some person capable of rendering greater services to the State. By these means they succeeded in depriving him of his support, and he was compelled to withdraw to the hospitable mansion of a friend in Germany. Here he became known to the emperor, who invited him to Prague, where, with an ample stipend, he resumed his labours. But, though surrounded with affectionate friends and admiring disciples, he was still an exile in a foreign land. Although his country had been base in its ingratitude, it was yet the land which he loved, the scene of his earliest affection, the theatre of his scientific glory. These feelings continually preyed upon his mind, and his unsettled spirit was ever hovering among his native mountains. In this condition he was attacked by a disease of the most painful kind, and though its agonizing paroxysms had lengthened intermissions, yet he saw that death was approaching. He implored his pupils to persevere in their scientific labours; he conversed with Kepler on some of the profoundest points of astronomy; and with these secular occupations he mingled frequent acts of piety and devotion. In this happy condition he expired, without pain, at the age of fifty-five.

COMPETITION FOR PRIZES OFFERED BY MESSRS WATHERSTON & SON, FOR DESIGNS FOR A DESSERT SERVICE OF PLATE.

SOMETIME since Messrs. Watherston & Son, of Pall Mall East, with a view to the advancement of British art in its application to Silversmith's Work, to be exhibited at the Paris International Exhibition of 1878, offered prizes, which were to be awarded by the Science and Art Department of the Council on Education of the South Kensington Museum.

The prizes of £100, £50, £30, and £20 respectively, were offered for the four best designs for a Dessert Service of Plate, comprising a Central Plateau, four Candelabra, four Fruit Dishes, four flower Stands, and four Salt Cellars. The Service, when manufactured, to be of a total weight of 2000 ounces of silver. The conditions of competition being as follows:—1. The competition was limited to candidates—British born—who are, or have been, *bonâ fide* Students of Schools of Art recognized by the Science and Art Department, and who have since 1867 taken a Third Grade Prize, or a higher prize in the National Competition of that Department. 2. The drawings and models of all competitors to be forwarded to the Department through the Secretaries of the Schools of Art in which they are or have been students. The design or designs of each competitor to bear a distinguishing motto, which motto, together with the competitor's name and address, had to be sent to the Department in a sealed envelope at the same time with the designs. 3. The competing designs to be delivered to the Science and Art Department on or before the 15th March, 1877. 4. The awards to be made by the Director for Art, E. J. Poynter, Esq., R.A., whose decision will be final. 5. The prize designs to become the property of Messrs. Watherston & Son.

The successful competitors for the prizes are as follows:

1st Prize £100 Owen Gibbons (Messrs. Maw & Co., Benthall Works, Broseley, formerly of National Art Training School).

2nd „ £50 W. H. Singer, from School of Art.

3rd „ £30 Robert Elson, Lambeth School of Art.

4th „ £20 John Marsh Benson, Sheffield School of Art.

The designs will be on view at the South Kensington Museum during month of May.

A MONSTER STEEL BANK ROOM SAFE.—A Monster Bank Room Safe is at present in course of construction by Mr. Samuel Chatwood, at Chatwood Safe Works, Bolton, and which when completed will be the largest of the kind ever made. It is intended for the Union Bank of Scotland and is 48 feet in length and 10 feet wide. The Monster safe is divided into three different sections connecting with each other, and each section having its own separate connection with the banker's room. Each part is fitted with Chatwood's patent lamp, which lights and also effectually ventilates the section at the same time.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 227.)

IN Madame Tussaud and Sons' Exhibition, London, is a gold repeating watch of considerable value, which was presented by Napoleon Bonaparte to Mr. Mate, his valet, who accompanied him in his Russian campaign. The valet declared it to have been presented to him on his leaving the Emperor's service after the battle of Leipzig. He sold it to William Bullock, of the Egyptian Hall, Piccadilly, who afterwards sold it for the same price as that which he had given for it to M. Tussaud. The same exhibition contains a singular secret clock, containing a small figure of Napoleon, which was formerly the property of his brother Lucien.

In an engraving published in 1830 Death enters a watchmaker's shop, and shows his hour-glass to the master, saying, "Nais-je bien?" to which the latter answered, "Vous avancez horriblement."

Babbage in his "Economy of Manufactures," 1835, says:—"An apparatus has recently been applied to watches, by which the hand which indicates seconds leaves a small dot of ink on the dial-plate whenever a certain stop or indent is pushed in. Thus, whilst the eye is attentively fixed on the phenomenon to be observed, the finger registers on the face of the watch-dial the commencement and the end of its appearance."

In the *Mirror* for 1837 appear certain flimsy rhymes, entitled "Elegy and Eulogy on two Rival Watches," which commence thus:—

"Here lieth one whose chief besetting sin
Was lying, tho' he'd neither tongue nor chin;
Consummate falsehood bubbled without rest,
From springs all lying 'neath his brassy breast.
That one who had no tongue from truth should swerve,
Sounds somewhat strange—but who has fail'd to observe
That words, tho' true, may be in fact a lie,
As falsehood may be uttered guiltlessly;
Whate'er is said, whate'er one may believe,
Lying is but the intention to deceive."

In the year 1839 a transparent watch of small size, constructed principally of rock crystal, was presented to the Academy of Science at Paris. It was made by M. Rebellier. The works were all visible; the two-teethed wheels which carried the hands were of rock crystal, and the other wheels were of metal. All the screws were fixed in crystal, and each axis turned on rubies. The escapement was of sapphire, the balance-wheel of rock crystal, and the springs of gold. This watch was found to keep excellent time, which circumstances was attributed by the maker to the feeble expansion of the crystal in the balance wheel.

A traveller, writing in 1844, says, "I saw to-day in Munich, above the door of a watchmaker's shop, the words Uhr Maker, a Maker of Hours."

In 1844, Messrs. Hart & Son, of Cornhill made for the Sultan Abdul Medschid, a watch, which as a whole was perhaps the most costly and elaborate piece of horological mechanism ever produced by English workmen up to that time. It was exhibited to the Queen and to Prince Albert as a triumph of British skill and taste. The watch was five inches in diameter; it was in a double case of twenty-two carat gold; the back external case was beautifully enamelled with flowers, within a border of arabesque scroll-work. This part of the workmanship was truly exquisite, the brilliancy of the colours and the delicacy of the pencilling surpassing anything of the kind of foreign manufacture. The dial was white opaque, enamelled on copper, similar to English watches in general, but the figures were Turkish characters. The hands were of blue steel, set with diamonds, one hand represented a dart, and the other a shorter dart, or arrow, with the crescent at one end. The movement was duplex with a chronometer balance, and jewelled in ten ruby holes. The watch struck the hours and quarters by itself, as the time represented; which striking was repeated together with the minutes, by pushing upwards a small gold slide. The inner bottom was of crystal, so as to show the repeating mechanism; and through the crystal were two holes to wind up the striking part and the movement. Wires, instead of the old method, by a bell, were used; and the sound resembled that of a powerful and harmonious cathedral clock. The pendant, or handle, was formed of five scrolls, shaped pyramidically, and beautifully engraved. The cost of this watch and a companion one, which were both ordered in 1843 through the Turkish embassy, was 1,200 guineas.

In 1845, the operatives of Birmingham, with a view to stimulate the manufacture of British jewellery, presented to Prince Albert, with other articles for the Queen, a watch-chain, seal, and key. The design of the seal was the Warwick Vase, standing on a

pedestal, supported by Mercury and Ceres; grapes sprung from the top of the seal, the tendrils of the vine gracefully forming the loop. The key was in tasteful keeping with the seal; the vine and the oak were represented as springing from the same soil, the foliage of each being perfectly developed. A pendant acorn chastely formed the termination of the hanging foliage in the centre of the key.

In 1847, the Polish emigrants in Great Britain and Ireland presented to Lord Dudley Stuart a gold watch, as a token of gratitude on the part of the whole Polish emigration in all countries of the world, for the services rendered by him to the cause of their nation. This watch, which was made by Messrs. Patek, & Co., Poles, established at Geneva, had a chronometer escapement, with compensation balance and isochronal spiral springs, its principal parts being garnished with rubies. It was wound up, and the hands could be set without any key, according to a very simple and ingenious contrivance invented by the manufacturers. It was a repeater; it marked the seconds, and on its pendant was constructed a small mariner's compass. The dial represented in basso-relievo the last seal of independent Poland, exquisitely engraved. In the centre was the white eagle, of which the red escutcheon was supported by two upright figures, the emblems of justice and peace. Around, instead of ciphers indicating the hours, were the arms of the eleven principal provinces of ancient Poland on palm branches; twelve o'clock being marked by the cross which surmounted the royal crown. All this allegory was well adapted to the occasion. At each hour one separate and distinct province, surrounded with a martyr's palm, recalled itself to the remembrance of the defender of the Polish cause. Justice and peace appeared as if pleading in its behalf, and the cross which crowned the whole seemed to remind sovereigns and nations of their relative duties. The compass was intended to direct attention constantly to the north, and the striking of each hour was an imitation of the alarm bell of Poland. On the back of the watch was carved in alto-relievo the coat-of-arms of the Stuart family projecting from a rich damask ground, which covered the whole watch. In the middle of the inside case was this inscription:—"Nobili Domino Dudley Coutts Stuart, Illi Assiduo Libertatis Poloniæ Defensori, Ejusque Filiorum Patria Orbis Adpitori, Die 3 Maii, 1847."

The *Illustrated London News* of August 23rd, 1851, tells us that there was then living at Holbeach, Lincolnshire, a watch-maker named Rippin, who was completely blind. He was a first rate hand at his business, and it was truly surprising to observe with what ease he could take to pieces and place together again watches of the most delicate mechanism. Some years previously Rippin was robbed, and the property taken from him consisted of watch wheels, hair springs, and other tiny things belonging to the trade. The thief was traced, and convicted at Spalding Sessions, the blind man having sworn to his property by feeling.

Early in the present century at Barnstaple, was a sign over a door, denoting that clocks and watches were repaired by William Hunter a blind man. He was born blind, and was brought up by his father, who was a clock and watchmaker, to that business, which he afterwards followed. He had plenty of employment, being considered by the inhabitants to be very efficient in his profession. He repaired musical clocks and watches, and seldom met with any difficulty in repairing the most complicated. It often occurred that in cases where others had failed in completely restoring the defective work of a clock or watch, this man discovered and set right the defect.

The Great Exhibition of 1851 contained numerous curious watches. Messrs. Rotherham & Sons, of Coventry, whose establishment was the only one of the kind in England in which machinery impelled by steam power was employed for performing many of the processes in the completion of a watch, exhibited the various parts of a lever watch in the progressive stages of manufacture; for instance, the top plates, the pillar plate and cap, cap-spring cock, namebar, potence, wheelbar, regulator, pendulum, stud, detent, detent-spring, stop, stop-spring, index, bolt, bolt-spring, dial-wheel, click and ratchet chain, barrel-cover, barrel-arbor, fusee, collet, main or great wheel, maintaining-power spring, maintaining-power wheel, fusee, roller, lever pallet, escape wheel and pinion, compensation-balance, pendulum-springs, ruby stones, jewel holes, cases, and rings for glasses. All the above were shown as roughly cast, then as formed into proper shapes, and lastly, as finished. Several movements were also shown, and a beautiful display of 137 watches of all kinds, from the plainest silver watch, to the most elaborately finished and ornamental gold watch.

Mr. Thompson exhibited his antichronograph for the instantaneous stamping or printing of time.

Mr. Dent, in addition to the large turret-clock in the nave, had a good display of chronometers and watches of various designs and

for various purposes. And in his collection was a watch with a contrivance for winding up and setting the hands without a key, by turning a knob in the ring or pendant by which it was attached to the chain or guard. The merit of this invention is said to be due to Mr. Viner, whose first construction was a jointed lever passing through the pendant, and acting directly upon the main spring, and furnished with a ratchet to prevent the recoil of the spring. More recently the spring has been wound up by means of a revolving cylinder; and this method has the advantage of giving power to set the hands also when required without a key. There are watches which wind themselves up, that is, are provided with a mechanism in which the bodily exercise of the wearer sets in motion a shifting weight, which, as the train runs down, again restores the force of the spring.

M. Ricusec, a watchmaker of Paris, obtained a prize medal for his astronomical marking watches, which had a second hand, that, on a pin being touched at the time of observation, made a black spot on the dial; and this process could be repeated at very close intervals, so as to record the exact moments of a number of observed phenomena following each other very rapidly, without the necessity of taking the eye off the object watched for, in order to look at the dial.

A silver watch which performed, while suspended in a glass globe filled with water containing gold fish, was exhibited by Messrs. Pettit. The object of this invention being to secure the protection of time-keeping and other instruments from water and sea damp.

In the Swiss collections from Geneva was a miniature watch, three-sixteenths of an inch in diameter, inserted in the top of a pencil case, and indicating on its tiny dial not only the hours, minutes, and seconds, but also the days of the month.

Mr. Timmel of Brighton, exhibited a small lever watch, the diameter of which was that of a threepenny piece.

The rose watch was the name under which Mr. Jones, of the Strand exhibited a beautifully mounted watch, the decoration of which was suggestive throughout. On one half of the margin around the back was engraved on blue enamel, "Man cometh forth as a flower and is cut down." On the surface of the richly engraved gold back was a Maltese cross in white enamel, and on its four limbs were represented the four seasons of human life, in the bud, blossom, decay, and death of a rose. On the other half of the margin round the back of the watch was inscribed the corresponding text to that above quoted, "It is sown in dishonour, it is raised in glory."

In the centre of the cross was a celestial crown of diamonds on a blue enamel surface, surrounded by an Olympic wreath of pearls, with glory rays in enamel radiating between the limbs of the cross. The dial represented in coloured enamel the beautiful rose-window of Westminster Abbey. On the twelve compartments indicating the hours were the names or the twelve apostles. On the bevel edge of the glass was inscribed in blue enamel, "He that taketh not his cross daily is not worthy of me."

FARTHING AND SILVER PENNIES.

THE Anglo-Saxon penny is known to have been as early as 688, and was perhaps earlier; it was of silver. The cross is said to have been deeply impressed on it, that it might be divided into the half ling or half-penny, and the fourth ling or fourth of a penny, now called farthing.

In 1444, 23 Henry VI., a petition was presented to the House of Commons, stating, that for default of farthings and half-pennies, "men were travailling our Countree, for part of the expense of necessitee must depart our Sovereigne Lordes coigne, that is to wete, a Penny in two peces, or also must forgo all the same Penny, for the paiement of a Half-Penny." Henry I. first ordered half-pennies and farthings to be made round, before that time they had been made square.

James I. granted by patent to Frances, Duchess of Richmond, the monopoly of coining farthings for seventeen years. A vulgar error prevails, that a "Queen Anne's Farthing" is of immense value. Her farthing is scarce, but not valuable, unless in fine preservation. The only coin of this denomination issued in her reign, bears her head, inscribed, ANNA DEI GLORIA; and on the reverse BRITANNIA, 1714. In the finest condition it is not worth more than 20s., or with the broad rim, 30s. There were patterns for farthings of her reign which were not issued, one with Britannia under a portal; and another with Peace in a car, which are rare and may fetch 40s. or 50s.

The rarest pattern is inscribed on the reverse BELLO ET PACE, 1713. The field in the centre is sunk, the rims indented, to prevent counterfeits being cast in sand.

MIRROR OF THE MONTH.

MAY.

MAY was the second month in the old Alban calendar, the third in that of Romulus, and the fifth in the one instituted by Numa Pompilius, which position it has held from that distant date to the present period. It consisted of 22 days in the Alban, and of 31 in Romulus's calendar; Numa deprived it of the odd day, which Julius Cæsar restored, since which it has remained undisturbed. The most reliable account of the origin of the name of the month is that which represents it as being assigned in honour of the "Majores," or "Majores," the Senate in the original constitution of Rome, June being in like manner a compliment to the "Juniores," or inferior branch of the Roman Legislature. The notion that it was in honour of Maia, the mother by Jupiter of the god Hermes, or Mercury, seems entirely gratuitous, and merely surmised in consequence of the resemblance of the word. Amongst our Saxon forefathers the month was called "Tri-Milchi," with an understood reference to the improved condition of the cattle under benefit of the spring herbage, the cow being now able to give milk thrice a day. It is an idea as ancient as early Roman times, stated by Ovid in his "Fasti," and still prevalent in Europe, that May is an unlucky month in which to be married.

While there is a natural eagerness to hail May as a summer month, and from its position in the year it ought to be one, it is, however, one of the months of spring.

In Scotland, in parts peculiarly exposed, the east wind of May is generally felt as a very severe affliction. On this subject, however, a gentleman was once rebuked in somewhat striking terms by one "Abnormis Sapiens." It was the late accomplished Lord Rutherford, of the Edinburgh Bench, who, rambling one day on the Pentland Hills with his friend Lord Cockburn, encountered a shepherd who was remarkable in his district for a habit of sententious talking, in which he put everything in a triple form. Lord Rutherford, conversing with the man, expressed himself in strong terms regarding the east wind, which was then blowing very keenly. "And what ails ye at the east wind?" said the shepherd. "It is so bitterly disagreeable," replied the judge. "I wonder at you finding so much fault with it." "And, pray, did you ever find any good in it?" "Oh, yes." "And what can you say good of it?" inquired Lord Rutherford. "Weel," replied the triadist, "it dries the yird (soil), it slockens (refreshes) the ewes, and it's God's will." The learned judges were silent.

QUERIES AND REPLIES.

Magnetism in Watch Tools.—A. B. C. asks, through a contemporary, "Will 'Seconds Pivot' or any reader say how magnetism is got out of watch tools, how to test them, and how to test balance spring?"

C. DETAILLE replies:—"If you wish to demagnetize any piece of iron or steel which is magnetic, one way is to heat the said iron or steel to redness, and then let it cool slowly. The following method does not require any heat, and is better suited for tools. Let us say you mean to demagnetize a file. First of all be sure that the file is magnetic, which you can ascertain by dipping it in iron filings. Next you must determine which way the poles of the file are placed. This you do by bringing it near a compass needle. If you find that the point of the file attracts the south end of the compass needle and repels its north end, then the north pole of the file is situated at its point. Now to demagnetise it, get a magnet of any kind, and with the north pole of the magnet rub the file from the south pole to the north, testing it by the above tests after each stroke, until it is demagnetised."

French Clock.—BEAK asks:—"During my business as clock-winder I came across a clock whose mainspring slips at the hook in the barrel. The clock continues to go the week. Would the slipping of the mainspring have any effect as to the clock keeping time?"

BONE answers:—"I do not see how a mainspring slipping at the hook in the barrel could affect the time the clock would keep while going, and if I found such a clock going irregularly I should at once examine the escapement, as it is just possible (though not within my own experience) that, if the clock had a very heavy pendulum, and the escape-wheel teeth were exceedingly fine, the shock to the movement at the time of slipping may cause some of these to bend, and should the clock continue to go after this injury, it certainly then would go indifferently as to time."

Whitening Silver.—CORNELIUS DABBER asks, "Can any one give me a method for giving silver ornaments (brooches, earrings, &c.) a dead white lustre? I have tried cyanide of potassium, which does very well for plated articles, but spoils real silver. I believe the process is called 'whitening,' and is produced by boiling the articles in a solution of some kind of salt. Can any one inform me on this subject?"

DENS replies:—"Cornelius Dabber" will obtain the dead white lustre by boiling the articles in a solution of alum, in a pipkin or a copper pan. Boil till the desired tint is obtained, then wash well in very hot water, using a stiff brush with soap and carbonate of soda."

GOLD IN PERSIA.

SOME little time ago one of the Shah's pish khedmet's (personal attendants), riding in the neighbourhood of Zenján, about 180 miles from Teheran on the Tabriz road, found a piece of gold ore. On inquiries he heard that one of the inhabitants of the village close by had occasionally been seen returning from the mountains in a mysterious manner. The villager was found and his house searched, and the pish khedmet discovered a small crucible, a forge, and appliances for melting; and nearly 80l. worth of pure gold. The man, nearly seventy years of age, said that he had found this gold at different times, and by stealth, during the last seven years; but he affirmed that there existed a very rich mine of gold whence he had obtained it. As the mountains were covered with snow, no further investigation could be made at the time. The man was taken to Teheran, and has been interrogated by the Shah himself. He of course is perfectly willing to show the spot where he found the gold, the more so as the Shah has given him the village in which he lived, close to the mine, as a free gift. The pish khedmet, who was the cause of discovering the mine, will receive the long-promised 3,000 tománs (1,200l.) for the first person who discovered a gold mine. After a few days a high functionary, the Amin i Sultán, accompanied by the old villager, is going to Zenján with some assistants who know a little of mining, and work is to be commenced at once. The Shah has already made a promise to the effect that he will present his people with one year's revenue, a sum of four million tománs (1,600,000l.). His Majesty will probably himself go to the mine in the spring to see the treasure. Nobody has the least doubt of this gold mine, which is to regenerate Persia with its millions and millions; it is, however, not at all certain whether a rich mine or even a poor one exists.—*British Mail*.

A CLOCK COLLECTOR.—One of those odd geniuses, who spend their lives and means in collecting curious and rare articles, lately died. His name was Sylo Bonafin, a retired merchant of Philadelphia. His elaborate collections were sold at auction, and their oddity has attracted general attention. His chief mania was for clocks, which literally covered every portion of available space in his apartments, whether they were placed on chairs, tables, shelves, or hung against the wall. Some of these time-pieces were of unique construction. One clock was made to run for 400 days after one winding, another was set in the dash-board of his carriage, and he used to regulate his drives to an exact period by it. In fact, he seems to have utilised his clocks to maintain his reputation for minute punctuality.—*Scientific American*.

"RE-TOUCHING" CHOICE STONES.—There is a factory in Idar, Germany, where the colouring of stones for art purposes is said to be carried on to a greater extent, and more perfectly, than in any other part of the world, the process pursued in thus converting chalcodonyes and red and yellow cornelians into onyxes resulting in the production of admirable specimens, which are known and prized in all the markets of Europe and America. The peculiarity of this process consists in the fact that the ribbons or zones in the different varieties of chalcodony—which, in the kidney-formed masses of that substance, lie superimposed—differ in their texture and compactness; but owing to their similarity of colour in the natural state, they can only be distinguished from each other with difficulty. The stone is, however, capable of absorbing fluid in the direction of the strata; and as the strata possess this property in different degrees, it necessarily follows that if a coloured fluid be absorbed, and the quantity taken up by the pores of the stone is different from every stratum or zone, a number of tints will be produced corresponding to the number of zones, each being distinct, and coloured in proportion to the quantity of the fluid absorbed. In this way a specimen of stone naturally but slightly coloured may be rendered equal to fine stratified chalcodony or onyx, and may be employed equally well in the engraving of cameos.

On the 25th ult., at the British Horological Institute, a lecture was delivered by Mr. J. Tripplin, Besancon, watch manufacturer, on "A comprehensive and easy method of examining Geneva watches with cylinder escapement." The lecturer explained that most of his principles were drawn from Mr. C. Sa'nier's works, and illustrated several of his arguments with diagrams on the black board. The lecture was divided into three parts, viz.:—(1.) Preliminary examination, motion work, barrel. (2.) The train. (3.) The escapement. And included in the brief space of one hour a remarkable and interesting summary of principles and practical methods cleverly combined. Altogether the *seancé* to which, by a happy innovation, ladies had been admitted, was a decided success, the rooms being crowded with an attentive and interested audience.

LONDON LEGEND OF THE CLOCK WHICH STRUCK THIRTEEN, AND SAVED A MAN'S LIFE.

THERE is a traditionary story, very widely diffused over the country, to the effect that St. Paul's clock on one occasion struck thirteen at midnight, with the extraordinary result of saving the life of a sentinel, accused of sleeping at his post. It is not less than half a century since the writer heard the tale related in a remote part of Scotland. In later times the question has been put, Is there any historic basis for this tradition? followed by another still more pertinent, Is the alleged fact mechanically possible? and to both an affirmative answer has been given. An obituary notice of John Hatfield, who died at his house in Glasshouse Yard, Aldersgate, on the 18th of June, 1770, at the age of 102, states, that when a soldier in the time of William and Mary, he was tried by a court martial, on a charge of having fallen asleep when on duty upon the Terrace at Windsor. It goes on to state—"He absolutely denied the charge against him, and solemnly declared, as a proof of his having been awake at the time, that he heard St. Paul's clock strike thirteen, the truth of which was much doubted by the Court, because of the great distance. But while he was under sentence of death, an affidavit was made by several persons that the clock actually did strike thirteen instead of twelve; whereupon he received His Majesty's pardon." It is added that a recital of these circumstances was engraved on the coffin plate of the old soldier, "to satisfy the world of the truth of a story which has been much doubted, though he had often confirmed it to many gentlemen, and a few days before his death told it to several of his acquaintances." An allusion to the story occurs in a poem styled "A Trip to Windsor," one of a volume published in 1774, under the title of *Weeds of Parnassus*, by Timothy Scribble:

"The Terrace walk we with surprise behold,
Of which the guides have oft the story told;
Hatfield, accused of sleeping on his post,
Heard Paul's bell sounding, or his life had lost."

A correction, however, must here be applied—namely, that the clock which struck on this important occasion, was Tom of Westminster, which was afterwards removed to St. Paul's. It seems a long way for sound to travel, and when we think of the noises which fill this bustling city, even at midnight, the possibility of its being heard even in the suburbs seems faint. Yet we must recollect that London was a much quieter place 150 years ago than now, and the fact that the tolling of St. Paul's has often been heard at Windsor is undoubted. As to the query, Is the striking of thirteen mechanically possible? a correspondent of the *Notes and Queries* has given it a satisfactory answer. *Second series* vii. 14. All striking clocks have two spindles for winding, one of these is for the going part, which turns the hands, and is connected with and regulated by the balance spring. Every time that the minute hand comes to twelve, it raises a catch connected with the striking part, which has been standing still for the previous sixty minutes, and the striking work then makes as many strokes on the bell or spring gong as the space between the notch which the catch has left, and the next notch allows. When the catch falls into the next notch, it again stops the striking work till the minute hand reaches twelve again an hour afterwards. Now, if a catch be stiff, so as not to fall into the notch, or the notch be worn so as not to hold it, the clock will strike on till the catch does hold. If a clock strike midnight and the succeeding hour together, there is thirteen at once, and very simply. If the story of St. Paul's clock be true, and it only happened once, it must have been from stiffness, or some mechanical obstacles.

WONDERS OF HOROLOGY.

MAGNETIC CLOCK AND WATCH.

WHEN the Grand Duke of Tuscany, in 1669, visited the Royal Society, at Arundel House, he was shown "a clock, the movements of which are derived from the vicinity of a loadstone; and it is so adjusted as to discover the distance of countries at sea by the longitude." The analogy between this clock and the electrical clock of the present day is not a little remarkable. The Journal Book of the Society for the above year, contains many allusions to "Hooke's magnetic watch going slower or faster, according to the greater or less distance of the loadstone, moving regularly in every posture."

THE PYRAMIDS OF EGYPT AS SUN-DIALS.

Sir Gardner Wilkinson conjectures that these stupendous monuments were built for astronomical purposes. "The form of the exterior might lead to many useful calculations. They stand directly due north and south, and while the direction of the faces to the east and west might serve to fix the return of a certain period of the year, the shadow cast by the sun, or the time of its coinciding with their slope, might be observed for a similar purpose."

GOLD.

(Continued from page 249).

"HAD his speech to the King (James I. and VI.), concerning his gold mines in Scotland, whereupon the King resolved to set them on anew. The King proposed to erect a Company of twenty-four gentlemen of sufficient estates, and each was to lay out 300*l.* sterling on these gold mines, for which each was to have the honour of knighthood, and to be called the Knights of the Golden Mines, or the Golden Knights. The money or virtuals so collected, to be committed to an English or Scotch treasury, or a storehouse. That Mr. Bulmer be Chief Governor during his life. That the workmen be weekly paid. That mills, dams, sluices, watercourses, &c., be made by Mr. Bulmer and his agents. Lastly, to erect a chapel, where the workmen may make their prayers to God for their souls' health, and then their work would be blessed, and come to a good end, as in other nations.

"The next time Mr. Bulmer came from Court he grew sick, and confessed that the Earl of Salisbury had crossed all his expected fortune, then he called himself and his family to remembrance, and said, 'Well, God giveth, and God taketh away!' and 'Blessed be the name of the Lord for ever!' More he said, 'Methinks it is strange that the King should make a grant, and a nobleman should cut it off!'

"Mr. Bulmer in his book, mentions how the rich silver mines of Hilderstone, in Scotland, were found and lost; how Sandy Maund found a heavy piece of red metal, descended from a vein, when it engendered with spar called *caicilla*. He found this under the silver Burnat Kingapple Hill. It proved wonderful rich when tried in the assay furnace by Mr. Bulmer, and that the great quantity of silver got in the pit called God's Blessing, was fined out of the red metal. The purest contained twenty-four ounces of fine silver, in each one hundred weight, valued at 120*l.* sterling per ton. It remains good till twelve fathoms deep, and from that till thirty, it proved nought. *Its ore grew like hair or grass.* The pit called God's Blessing was so called by Mr. Bulmer because of the wonderful works of God he had seen there, the like never known before in these kingdoms!"

Mr. Bulmer remarks, "how long it will continue, is known unto God, for mines are as uncertain as the life is to man, which is like a bubble on the waters to-day, to-morrow none." Again, "a mineral man should be a hazard adventurer, not much esteeming whether he hit or miss. If he happen to win, he must esteem as nothing. If he lose all, yet he must think he has got something. If he find a rich vein, let him not esteem it, for it is like a man stung with a nettle. If he seek in hopes to find out proof of it, yet he must believe that he hath, or shall have what he really hath not."

Atkinson continues: "Mr. Bulmer writeth of the variety of stones and metals found by him in Scotland; (1) Natural gold, great and small. (2) Natural silver, the like he never saw. (3) Copper stones, of the richest sort. (4) Lead ore, great store, at Leadhills. (5) Iron stones in abundance. (6) Beds of Alabaster. (7) Marble stones. (8) Amethyst stones, very amiable, for he had a man that wrought them, one of which the King wore. (9) Natural pearl in the sea sand in Galloway. (10) Infinite other riches are there also. The author saith of Mr. Bulmer that he gave gold several times to unthankful persons, and sold much of it for half price, and such as he was most liberal to, were readiest to cut his throat. He continued still liberal in hospitality. None like him in that time, as is reported through all Crawford Moor. That he had many irons in the fire, and often intricate matters to decide, and too many waiters prodigal hanging on each shoulder. He wasted much himself, and gave liberally to many to be honoured, or else he might have been rich. By such means he was impoverished, and followed other venial vices, not allowable, so, once down, aye down, and at last he died 340*l.* sterling in my debt, and left me in Ireland in much debt for him, and God forgive us all our sins, but if he had lived till now, he might have paid all men."

We must here remark that Sir Bevis Bulmer was one of the greatest speculators of the day, and appears to have possessed not only remarkable energy, and extraordinary talents, but also many good qualities. His first venture seems to have been at Leadhills, in Lanarkshire, which proved very successful. He then engaged in working the silver-lead mines at Chenton Minery, in the Mendips, which was, perhaps, his most profitable investment. He also engaged in the re-working of the Combe Martin silver-lead mines, in Devonshire. From an old author we read, that, "A new Silver mine was discovered at Combe Martin, by Adrian Gilbert, and John Poppler, a lapidary, with whom Mr. Bulmer bargained for one half of the whole, he bearing charges for two years. This mine yielded to each of the partners 10,000*l.* sterling. It continued four years reasonably good. The

last cake of silver Mr. Bulmer gave to the City of London, which Mr. Middley made into a cup and cover, with Mr. Bulmer's picture, and these verses thereon:

"When waterworks at Broken Wharf,
At first erected were,
And Bevis Bulman by his art,
The waters 'gan to rear,
Dispersed, I in the earth did lie,
From all beginning old,
In place called Comb, where Martin long
Had hid me in his mould,
I did no service on the earth,
Nor no man set me free,
Till Bulmer by his art and skill
Did frame me thus to be."

On a gold porringer presented by him to Queen Elizabeth, the following lines were engraved:—

"I dare not give, nor yet present,
But render part of that's thy own;
My mind and heart shall still invent
To seek out treasures yet unknown."

and the following inscription was formerly over the door of his house at Glengonnar.

"In Wanlock, Elwand, and Glengonnar
I wan my riches, and my honor."

But poor Sir Bevis Bulmer's good fortune did not last. In 1595, he erected water works at Broken Wharf, for the purpose of forcing and conveying water to the central and western parts of London; an immense capital was invested, for which, however, he never had any adequate return. He also engaged in many other speculations, and at last, having too many irons in the fire, became greatly embarrassed. About 1605, James I. took him under his patronage, and made him "Chief Governor of the King's Mines," which post he held until his death, which took place in 1613.

Atkinson gives a curious account of the improvements in gold refining during Elizabeth's reign, and of their introduction by foreigners which we quote as likely to interest our readers, Referring to the fleets of the King of Spain, (Phillip II.) he says:—

"Sometimes the English pirates meet there withal, knowing the time when they are to be laden, and strip them quite of all such gold and silver. I have sometimes seen of the same brought into Devon and Cornwall, so as Londoners have ridden thither, and purchased much thereof. For about the year 1585, there came a fleet from the West Indies to Seville, with eleven millions of pieces of eight. Much of the same silver was conveyed into London before it came to Seville, for good fellows met with them and forced them to share, for which they gave the Spaniards store of victuals, and therewith most of force be content. I was then an apprentice at the Appletree, in Red Cross Street Without, Cripplegate, and was admitted to be refiner, or finer, at the Tower of London, instead of my master, Francis Tiver, a gold refiner, where I refined three days in the week round Indian cakes of silver, (*plata pina*?) for Sir Richard Martyn, Knight and Master of the Mint and one William Clarke was a chief agent therein, and saw it all done. Besides this many times there came of such like cakes to be done in Red Cross Street, and Anthony Martyn was agent for Sir Richard Martyn, and I did refine thereof some days 1000 pounds weight, and on some days 500 pounds weight or 600 pounds weight. And sometimes I have had round cakes of silver brought to be refined in great batches, which we before sent out for plumbers sweepers, by cart loads, because the common people should not perceive it from tin to lead. And it was commonly refined by night, and afterwards melted and cast into ingots of fine silver of 40 pounds weight each ingot. and so returned by night always to Sir Richard Martyn's house in Cheapside, by labourers and porters, which blew the bellows for me: and so thence to be conveyed into the Tower of London, to be coined by his own servants; and thus it was weekly turned into money.

"I have seen lead before the silver was extracted, make good tavern pots, bowl pots, member pots, and saucers, much like unto pewter, but was none. Now, again, some men demand how I first knew these things, and of whom, saying, 'I knew his master, with whom he was an apprentice, and his master never knew any such art.' I answer, 'Neither knew you the names of those who first discovered the art of extraction in England, nor who taught the same, to whom, nor why. To discover the art thereof cost my master Tiver 50*l.* sterling, besides other charges, meat and drink.' They also taught the art of the true searing furnaces, and for drying

furnaces, and semeteering furnaces, and sundry other furnaces, to melt by flame, &c. And lastly, how gold and silver might by the easiest means be drawn out of dry minerals, and mineral stones, and how verditer might be made without the use of strong water, which painters do use to paint with.

"About this time Sir Francis Drake brought into England great store of gold and silver and copper in abundance, especially of the copper mines from St. Domingo. A great quantity thereof he brought into London, and much thereof was sold for red copper in price, whereof was made both kettles and pans, and great caldrons to boil in, ordnance and other cast pieces, before the worth thereof was known. At last these foreign travellers, who had taught the art of extraction out of dry minerals and mineral stones, having travelled throughout far countries, and behaving themselves like artists and workmen, were much accounted of in London, for their experience. First showing how the silver may be extracted out of the copper mines, and most of the copper sand, for which they were well paid by Mr. Tiver. And at that time, they taught him to make *aqua regis*, to eat up gold into it, and leave the silver, as aquafortis did silver, and leave the gold like sand. And lastly, how to make blue verditer, and green verditer, without the help of strong waters, or green waters; and Mr. Tiver paid them well for it. The name of one, and the principal, was:—

"Jacob Yaughall, a Jew,

"Henrique Guarro, a Portingal.

"Don Francisco, and Don Fernando, two travellers came from the West Indies."

Now, concerning their acts, and what they have seen in foreign provinces. Jacob Yaughall saith he saw natural gold and silver extracted out of dry minerals, or mineral stones, and they were called as followeth: the sappar, the callamineer, the saxon, and the salaneer stones, the acella, the ticano, the centeno, and the menduta stones. Besides he hath seen both copper, tin, lead, and iron, to contain in each of it, silver; and several other minerals and mineral stones to hold both gold and silver. And he hath seen quicksilver issue out of the rock, or crag, and out of a flint stone, which if any wise man can believe it, then will I believe it also, but I am like Didymus, before I see it, I cannot believe it. And they also said that they had seen copper hold perfect gold, and tin perfect gold, and lead to hold perfect silver, in foreign countries, and iron to hold both gold and silver, and many of these to hold neither gold nor silver, but to be perfect of themselves.

"Now to return to the four travellers: namely, Jacob Yaughall the Jew, Henrique, Francisco, and Ferdinando, how they tried themselves severally, to be expert artists, and to have travelled over the greatest part of the West Indies. They came to London in A.D. 1572, where they taught the art of extraction at Mr. Tiver's house unto him in the year of our Lord God, 1585, and were paid therefore: for at that time few men understood the art thereof, and the profit that ensued thereby. First, what a charge of fire, in wood and coals, is to be saved in trying of dry minerals and stones. Secondly, they showed the proof thereof by some minerals and dry stones wherein nothing could be discerned; which they brought with them from Potosi mines, in the West Indies; and they said they were there when one bed or vein of silver was newly discovered, which was very small, and therefore small accounted of, and that it was a long time in discovering. And third, that the superiors and governors thereof had been twelve years and upwards before they found the depth thereof, not countervailing the tenth of the charge which thereunto belonged. And this was in A.D. 1545, for in that year they washed and scoured much earth, which before had been turned, digged, and gathered together near unto the river sides, within valleys and combs, where oftentimes they found out perfect hops of gold, and pieces of silver, black-eyed, like unto Indian peas, which they call straggling gold and silver, and some like unto pompon seeds, or to pippon seeds.

"And there was a book written of their travels, called the 'Jews' Travels.'"

Atkinson makes some very pertinent remarks as to mining transactions, he says, "When mines hit, it is the best got gear in the world, it is so profitable to all, and hurts none, and when they hit not, though it be lost for a time, God is thereby honoured in searching his hidden treasures out of the depths of the earth. I read of a godly man's opinion on the first digging the earth for gold and silver:—

"Woe to the man that first did dig the ground,
To find the mines of silver and of gold,
For when it lay hid, and unto us unknown,
Of strife and debate the seed was unsown,
Then liv'd men well, and held themselves content,
With food and cloth, and payed them no rent."

He also "prays that God may be his guide in his business of mining, for religion was a special cause in this enterprise to discover the secret works of God. Art, skill, fame, and hopes of everlasting life led him to these worthy attempts to discovery of minerals within the earth, if it hit, it must be a renown to all Christendom, and register the names of the undertakers in the Kalendar of never dying memory."

Atkinson also says, "There is power given unto minerals to *engender* in the earth, or to couple with other stones, which are their feeders." This seems to have been the prevalent opinion at this period. Moses Stringer, who lived near this time, and was Governor of the Mines Royal Company, remarks: "The products of all natural bodies may be reduced to two classes, namely, animal, and vegetable, of which the latter comprehends not only plants, &c., but metals, minerals, &c.; for the philosophers of this and the last age, tell us (and that, too, with good reason), that 'tis highly probable they have a vegetable power, and that as the beds are emptied by the miners, so after some time, they recruit. Mr. Boyle has already been large on that subject, &c." Boyle and Bacon were certainly of this opinion.

James I.'s reign is remarkable for the interest which Lord Chancellor Bacon took in the affairs of the Mines Royal Company, which received further grants from the King. Mr. Bushell, his private secretary, gives a good account of the mining transactions at this period. He states that he was trained by Bacon to what he calls the Baconian system of mining, which consisted in running long adits, and in ventilating them by bellows or shafts. Bushell worked the silver-lead mines in Merionethshire, on the recommendation of Bacon, and they yielded enormous profits. It is said that being a staunch royalist, he supplied Charles I. with lead for shot, and with silver, having it minted in Wales; clothed a large body of troops, and defuded Lundy Island, of which he was governor. Also that he raised a regiment of horse for the King's service, all of which eventually got him into difficulties, as the government never re-imbursed him except by a mining grant, which was of little use without the necessary capital for working it.

The reign of Charles II. was distinguished by its fashion for chemistry and philosophy. "King Charles," says Moses Stringer, "nursed the corporations of the Mines Royal and united them, set up a laboratory in Whitehall, and worked in mineral affairs with his own hands; and many peers and gentlemen imitated his example, erected laboratories in their own houses, and laid their hands to the crucibles and melting pots; namely, the Duke of Buckingham, Lord Chesterfield, Lord Dorset, Lord Capel, Lord Byron, Lord Ashley Cooper (Earl of Shaftesbury). Sir Thomas Williams was the King's laboratory keeper; the Honourable Robert Boyle, Sir Clement Clarke, Sir Talbot Clarke (his cousin), and Colonel Ashburnham, assisted in the work; when the King, to strengthen these Corporations for mines and mineral works, erected two Royal Societies or Companies, one called the Royal Society, whose office was to encourage arts and inventions, and to entertain such foreign artists as should come over, and to that end there is, or ought to be, a ball or entertainment for three days, while such an artist can shew a specimen of his performances, and this is at Gresham College, in Bishopsgate Street."

To be continued.

A FAMILY RELIC.

THE Civil Tribunal of the Seine has just heard a suit brought by the widow of General Anderson, of the United States army, to recover the value of a ring lost while in the hands of M. Leclerc, a jeweller, for repair. The defendant did not contest his liability, but the parties could not agree as to the sum to be paid as compensation. In addition to the value the plaintiff attached to it as a family relic, it having been given to her as a betrothal present by her now deceased husband thirty years ago, she maintained that it was of great intrinsic worth by the size, number, and quality of the six stones contained in it, two sapphires, a ruby, a topaz, a jasper, and a bloodstone, and in consequence claimed 3000fr. The jeweller on his side offered 164fr. at which he estimated the cost. As neither of the parties could prove their own estimate of the value, or disprove that of the other, and the appointment of an expert would have been useless, no elements existing on which he could make an appraisal, the court took the circumstance into consideration and awarded 1500fr. and the costs.

ERRATUM.—In describing the Bryant Testimonial Vase, manufactured by Messrs. Tiffinay & Co., of New York, in the March number of this Journal, the words "This to be executed in oxydized silver," should have been "It was executed in oxydized silver."

CORRESPONDENCE.

It must be distinctly understood that we do not necessarily identify ourselves with the opinions or views of any of our Correspondents. Our pages are alike open to all for free discussion of questions connected with the various trades which we represent, and all Correspondents will find every opportunity afforded them for expressing their opinions.

To the Editor of THE WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—As a manufacturing Silversmith of 35 years' experience, I should like to place a few ideas before you respecting the agitation raised by Mr. Watherston to take off the duties on silver goods. I contend:—

- (1.) That taxes are necessary.
- (2.) That the tax on silver goods being upon articles of luxury, and not of necessity, is a just and proper tax.
- (3.) That it is easily collected and carries with it the further advantage, that of a guarantee of quality and without which the silver trade would become a swindle.
- (4.) That a considerable part, probably two-thirds of the silver manufactured, is for presentation, from a fruit knife to an epergne, and that the reduction or abolition of the duty would not increase the trade.
- (5.) That practically silver (spoons and forks especially) was reduced 1s. 6d. per oz. some years ago by the action of a city retailer, without increasing the consumption.
- (6.) That in spite of the increase of prosperity of the country, the trade in silver goods has decreased, thus showing, conclusively, I think, that the public prefers some other class of goods.
- (7.) I also contend, in spite of all the bold assertions to the contrary, that the silver trade is perfectly free. There is no duty on exported silver goods at all, that is—the duty paid, is returned to the exporter in full. So the foreigner or colonist gets English made silver goods with the English Hall mark without paying duty to the English Government. Foreign nations can compete with us on exactly the same terms, so there is no protection, and where there is no protection, the trade must be free. Perhaps there is another kind of free trade that I do not know.

I am, Sir, yours respectfully,
MANUFACTURER.

April 28th, 1877.

To the Editor of THE WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—I have read with considerable interest the article in your last issue upon the present state of the jewellery trade. There can be no doubt of many of the truths therein contained, but jewellers must not lose sight of the fact that while we in England have been passing through the worst two years known since 1843, the Americans have been suffering even worse than ourselves. Several of the men who left Birmingham when trade was very good have returned, and state that the trade in America is in a worse condition than in England. Another cause that makes the jewellers very short of trade is owing to the fact that fashion has very much altered during the last two years and a half. Up till that time, fringe brooches and earrings were all the rage, while at present, not one earring in twenty has more than two-thirds the work or value, through the chain fringe work going out of date.

Any jeweller that can keep on thirty workmen at the present time would have to take on eight or ten more if the fringe work was in general wear; besides this, bracelets have not been worn near so much during the last two seasons, which alone in many of our workshops would make a great difference among the better class of workers; the consequence would be that the bracelet maker would have to be put on to brooches and earrings or locket, which to some extent would cause a greater quantity of usual stock to be made up, and this at a time when general depression was being felt in most branches of trade; it would make the jewellers' stocks increase to a larger extent than usual. Another cause of the bad trade is, no doubt, owing to the number of failures, and a very great quantity of all kinds of gold goods being forced upon the open markets, through the different sales that are every week taking place in our large towns; within the last month there has been three or four public sales in Birmingham, most of the stock being coloured gold, and this is sold at any price the public think right to give. Until these sales come to be fewer in number the manufacturers, factors, and shopkeepers no doubt, will have to put up with short work.

Yours obediently,
A MANUFACTURER.

April 16th, 1877.

THE SILVERSMITHS' FREE TRADE ASSOCIATION.

To the Editor of THE WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—It will interest your readers to be informed that, as a result of the meeting of the Trade reported in your last issue, an Association is being formed with the following objects, viz.:—

- (1.) To obtain the abolition of the duties now levied upon gold and silver plate.
- (2.) The abolition of licences (£2 6s. and £5 15s. respectively) or the extension of the licensing system upon a reduced scale to all trades and professions alike.
- (3.) To obtain a revision of the laws relating to Hall-marking with special reference to gold wares of a lower standard than 18 carats fineness.

It is proposed, at an early date, to call a meeting of the entire trade with a view to approaching the Government upon the subject of the scheme. The time would appear to have arrived when members of the Gold and Silver Trades should decline to be taxed to the relief of professional men and other traders. If gold and silver plate be taxed, why not electro plate, pianofortes, carriages, furniture, pictures? If one trade require to be licensed, why not all trades? If trades, why not professions?

These are propositions which apparently are unanswerable, but with reference to the tax upon silver plate it is not remarkable that manufacturers should oppose the abolition of the duty.

Probably it is but little known by retailers that manufacturers get about 2d. per ounce profit out of the duty. The duty paid to Government upon unfinished plate is 1s. 3d. Goods are sent to the Hall as nearly finished as possible; hence the advantage to the manufacturer. It remains to be seen whether the Chancellor of the Exchequer will permit the sum of £7383 per annum to be distributed among a few manufacturers, manifestly to the disadvantage of thousands of retailers, and resulting in the crippling of a trade which, but for the tax, might become a large and important branch of industry.

No one grudges the manufacturer a fair profit, and if the tax be taken off, as doubtless it will be ere long, he must adjust his prices for fashions accordingly; this is a matter with which retailers have no concern; they will, as ever, buy in the cheapest market and sell in the dearest; competition regulates prices; but that manufacturers should get a profit out of the duty is one of the best arguments against its continuance.

At least such is the opinion of

Sir, yours obediently,
EDWARD J. WATHERSTON.

Pall Mall East, April 24th, 1877.

To the Editor of THE WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—Can you oblige me with the addresses of firms manufacturing gold and silver medals suitable for presentation, and if they will supply pattern sheets to a Secretary of a Club.

Yours respectfully,
BRASS.

To the Editor of THE WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—Seeing questions put and answered touching different branches of the trade, I would ask do any of your readers know of any liquid composition whereby steel, which is exposed to a damp atmosphere, can be coated to prevent rusting.

Yours obediently,
S. F. W.

PRICES CURRENT FOR GOLD AND SILVER—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY. Fine Gold, 84s. per oz. Fine Silver, 4s. 8d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 8d. to 4s. 10d. (variable.)

FRAUDS ON CHATWOOD'S PATENT SAFE AND LOCK COMPANY.

AT the Greenwich Police Court, on March 29th, Henry James Scott, of 2, West Avenue, Walthamstow; Gustav Wagner, and William Steele surrendered in discharge of their recognisances to answer a charge of conspiring together and defrauding Mr. Richard Carpenter, a pawnbroker, at Deptford, of £75, in the sale of a safe falsely represented to be one of Chatwood's patents.

The hearing of the case had been before the Court on four previous days, and the evidence taken was of great length. From this it appeared that the three defendants had been in the service of "Chatwood's Patent Safe and Lock Company (Limited)"; Scott as manager at the office of the Company, in Cannon Street, City; Wagner as a safe finisher at the company's works at Bolton, and Steele as traveller and collector in the Loudon districts. In 1875 the prosecutor purchased a safe at the firm for £55, Scott at that time being the manager, the safe being required at business premises at Dockhead, Bermondsey. In April last, wanting a large safe for his Deptford premises, he again called at the City office, and again saw Scott, who was asked if the firm had a second-hand safe of the dimensions mentioned, of the same quality as that he had previously purchased, burglar-proof and fire-proof. Scott stated that they had not then such a safe, but that the firm had supplied a safe to the Peruvian Government for an office in Paris, which was about being broke up, and that the safe was to be resold, advising him to wait a short time for the purchase to be made, the price named being £75. After waiting two or three weeks the prosecutor received a letter from Scott notifying that the safe had arrived from Paris, and would be delivered at his Deptford premises on the following day, which was done, a van arriving with it, and seven or eight men, Wagner superintending the moving, and placing the safe in its proper position, which occupied about three hours. After the delivery Steele called upon the prosecutor with an invoice for the amount due (£76 10s.) 30s. having been charged for the carriage of the safe from the Bricklayers' Arms Station, but as there was no statement in the invoice that the safe was of Chatwood's make, the money was not paid, Steele taking away the invoice and returning next day with an invoice that was satisfactory, and the money was then paid. Recently it had come to the prosecutor's knowledge that the safe was not the make of the firm, and that the safe was neither burglar-proof nor fire-proof, and as such was worthless. Evidence in support of this was given by Mr. Webster, foreman of the company's works at Bolton. Mr. S. Chatwood, the managing director of the company, gave evidence at some length, showing that Scott was engaged as manager at the City office in 1876. His duty was to make daily entries of the business done, and to pay over money to witness by order, and there had been no entry of the sale of the safe to the prosecutor, nor receipt of the money, and the safe so sold was not of the company's manufacture, and was neither burglar-proof nor fire-proof, and its worth was nothing more than that of the metal it was made of. The engagement with Scott was that he was to devote his whole time to the business of the company, to sell no other firm's or company's safes, and he had no authority to sell any second-hand safes, which, if bought and allowed for in exchange for the company's safes, were sent at once to auction and sold.

Mr. Besley elicited from Mr. Chatwood, in cross-examination, that having charged Scott at the Mansion House, last August, with the embezzlement of £17, for a second-hand safe taken from a customer, he withdrew from the prosecution before laying any evidence on that charge before the court, at the urgent entreaty of Scott's solicitor and friends, on their assuring him that prisoner was sorry for what he had done, but that they alleged he had acted under a mistaken view of his true position, not only in the case of that one safe but of a lot of others, and if he (Mr. Chatwood) would take a merciful view of the buying and selling second-hand safes on his own account, and give him the benefit of the doubt, then, that on his release he would render a true statement of all such dealings, a faithful account for the moneys, and would be able to explain everything else to the entire satisfaction of Mr. Chatwood, who however, feeling the responsibility of having put Scott in a position of trust, which he had abused to the great injury of the public, insisted that before releasing him they must promise that he should for ten years earn his living at his own or some other trade, outside the safe trade in England and Scotland, where he could not defraud the public by the use of Chatwood's name. On receiving this protection for the public, Mr. Chatwood had consented to give him the benefit of the doubt in respect of the charge before the court, but reserving his entire liberty of action in all other matters if Scott

should be unable to give satisfactory explanations. That he (Mr. Chatwood) had refused to sign a paper brought to him, as he declined to be a party to what, in the event of Scott's inability to give satisfactory explanations, might be construed into compounding a felony; but that if Scott was able, as his friends alleged, to prove that he had committed no frauds, then the matter would, of course, drop, not otherwise; and that, as a matter of fact, on Scott's release he did not, and had not since, offered a word of explanation or rendered any account.

The prisoners were then committed for trial at the Old Bailey Sessions, Scott in one surety of £100 and himself in a like sum, and Wagner and Steele in a surety of £50 and themselves in £100.

At the April Sessions of the Central Criminal Court, they were charged with conspiring to defraud, and a second indictment charged Scott alone with obtaining money by false pretences.

Mr. Chatwood, Mr. Carpenter, and other witnesses were called in corroboration of the opening statement of Sir Henry James, the first-named gentleman proving that Scott, as the London manager, was bound by agreement to devote the whole of his time to the service of the firm, and was neither entitled to deal in second-hand safes or to employ workmen other than those of the firm, and that the safe supplied to Carpenter was not of the company's manufacture, that it was not a second-hand safe at all, but a worthless new one made to imitate a Chatwood safe. No trace of this transaction appeared in the books of the firm kept by Scott, nor of the money received from Carpenter for it.

The Recorder having summed up, the jury convicted Scott and Wagner and acquitted Steele.

The Recorder said no doubt Scott had been a respectable man or he would not have occupied the position he had in the prosecutor's firm. Unlimited confidence appeared to have been reposed in him, but this he had betrayed, and not only had done all he could to injure the prosecutor, but had defrauded a customer by falsely representing the safe to be his employer's manufacture. The evidence had been the clearest ever brought before him in any case. The offence was a serious one, and he would be sentenced to eighteen months' hard labour. Wagner, although convicted with Scott, was not at the time in the prosecutor's employment, and must go to gaol for six months with hard labour.

The Druggists' Circular gives the following formula for artificial diamonds: Take pure silica, 100 parts; red oxide of lead, 150 parts; potash, calcined, 30 parts; borax, calcined, 10 parts; arsenious acid 1 part. This, says the *Druggists' Circular*, produces a paste which has great brilliancy and refractive and dispersive powers, also a specific gravity similar to that of the oriental diamond. It fuses at a moderate heat, and acquires the greatest brilliancy when re-melted and kept for two or three days in a fused state, in order to expel the superabundant alkali and perfect the refining. This paste is used not only to produce fictitious diamonds, but besides other fictitious gems, of which it forms the basis.

IMPORTANT SALE OF WATCHES, CLOCKS, JEWELLERY, &c.—Messrs. Edwin Fox & Bousfield announced that they will sell on the premises No. 9, Royal Exchange, on Thursday, May 10th, and following day, the valuable and costly stock of the late Mr French. Catalogues may be had on the premises, or of the auctioneers, 24, Gresham Street, E.C.

A REMARKABLE PIECE OF CORAL, taken off the sub-marine cable near Port Darwin, is spoken of in a Melbourne paper. It is of the ordinary species about five inches in height, six inches in diameter at the top, and about two inches at the base. It is perfectly formed, and the base bears the distinct impression of the cable and a few fibres of the coil rope used as a sheath for the telegraphic wire still adhering to it. As the cable has been laid only four years it is evident that this specimen must have grown to its present height in that time, which seems to prove that the growth of coral is much more rapid than has been supposed.—*Jewellers' Circular*.

PLATED CANDLESTICKS.—Candlesticks plated with silver were first made about a century back. Horace Walpole, in a letter to Mr. Montagu, writes, Sept. 1, 1760:—"As I went to Lord Strafford's I passed through Sheffield, which is one of the foulest towns in England, in the most charming situation; there are 22,000 inhabitants making knives and scissors; they remit £11,000 a week to London. One man there has discovered 'the art of plating copper with silver;' I bought a pair of candlesticks for two guineas that are quite pretty."

THE Watchmaker, Jeweller, and Silversmith,

A MONTHLY TRADE JOURNAL,

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades; published at MILNERS' BUILDINGS, MOORGATE STREET (OPPOSITE MOORGATE STREET STATION), LONDON, E.C. Booksellers and Newsagents supplied by Messrs. Catty & Co., 12, Ave Maria Lane, Paternoster Row, E.C.

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Advertisements, Remittances, Subscriptions, Orders for Copies, and all Communications to be addressed to the Publisher of the WATCHMAKER, JEWELLER, AND SILVERSMITH, as above.

Cheques and Post-office Orders to be made payable to A. VICTOR, at Lombard Street Post Office.

SPECIAL NOTICES.

IN order to meet the requirements of the steadily increasing business of this Journal, the offices thereof have been removed to more eligible premises in MILNERS' SAFE BUILDINGS, MOORGATE STREET (opposite Moorgate Street Station.)

We must thank our patrons and the trade in general for the encouraging patronage hitherto received, and which has necessitated this removal, and hope to be favoured with a continuation of support in our new offices, where every exertion will be made by us to merit the confidence and promote the interests of the various trades represented by our paper.

The extensive and valuable Stock-in-Trade of the late Mr. French, the eminent watch-maker, of Royal Exchange.

MESSRS. EDWIN FOX and BOUSFIELD will SELL by AUCTION, without reserve, on the premises, No. 9, Royal Exchange, on Thursday, May 10th, and following day, at 1 precisely each day, the whole of the valuable and costly STOCK-IN-TRADE of the late Mr. French, the well-known watch and chronometer maker, including 170 clocks and chronometers, suitable for all reception rooms, halls, shops, &c., in ormolu, bronze, fancy wood, and brass cases, about 400 gold and silver watches, of the best manufacture, in repeaters, keyless, and others, stands of musical birds, valuable selection of diamond rings, an assortment of gold chains, charms, trinkets, &c.; two oil paintings (the King and Queen of Spain) office fittings, and effects. May be viewed two days prior to sale, and catalogues had on the premises, and of Messrs. Edwin Fox and Bousfield, No. 24, Gresham Street, Bank, E.C.

CLOCKS, WATCHES, AND BELLS.

Just Published.

A RUDIMENTARY TREATISE on CLOCKS, WATCHES, and BELLS. By Sir EDMUND BECKETT, Bart. (late E. B. Denison), LL.D., Q.C., F.R.A.S. Sixth edition, revised and enlarged, with numerous illustrations. 12mo, cloth boards, 5s.6d. Postage 4d.

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MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

BUSHNELL CHARLES JAMES HENRY, trading as C. BUSHNELL & Co., 5, Caroline Street, Birmingham, jeweller. April 24.

CAIN, HENRY CHARLES, Princess Street, Halifax, watch-maker and jeweller. April 20.

CRAGG, SAMUEL, 57, Trafalgar Street, Leeds, jeweller. April 16.

JACOB, ALFRED, 53, Vyse Street, Birmingham, manufacturing jeweller. April 16.

RAY, ELIZA SARAH and EDWIN STEWART HARRISON, 35, Great Castle Street, Regent Street, jewellers. April 19.

REDGATE, EDWIN, Church Street, Sheffield, and Nottingham, sewing machine dealer and jeweller. April 16.

TAYLOR, WILLIAM, trading as JOHN LEE, 17, Upper Well Street, Coventry, watch manufacturer. April 11.

BOLZANI, JOHN, 84, High Street, Winchester jeweller. March 27.

COLMAN, SOLOMON, 340, Rochdale Road, Manchester, jeweller. March 29.

SILVESTER, ARTHUR LUCAS and WILLIAM HENRY HIRON, 51, St. Paul's Square, Birmingham, jewellers. March 31.

WALKER, EDGAR, 174A, Oxford-street, watchmaker. April 4.

DAVIES, EPHRAIM, Doncaster Road, Mexborough, Yorks, jeweller. April 10.

MANSON, JOHN, 69, Queen Street, Cheapside, and 63, Moray Street, Holloway, jewellers (sep. creditors). April 9.

FIELD HENRY, Northwood Street, Birmingham, spoon and fork manufacturer. April 24.

PARE CHARLES HENRY, trading as CHARLES PARE & Co., Lozells Road, Aston, jeweller and factor. April 26.

WELSBY SAMUEL, 28, Horsemarket Street, Warrington, and Chester, and Stockton Heath, watchmaker and Shopkeeper. April 24.

Adjudications of Bankruptcy.

BROOK, HENRY JOHN, Upper Hanover Street, Sheffield, electro bronzer. April 13.

MARKS, HENRY, Wharfedale Street, Newcastle, jeweller. April 18.

Trust Deeds Granted in Scotland.

GORDON, EDWIN, Newton-Stewart watchmaker and jeweller. Claims with John Miller & James H. Ferguson, 71, Queen Street, Glasgow.

RUTLAND, ROBERT WILLIAM, 152½, Castle Street, Glasgow, watchmaker and jeweller. Claims with George Gray & Threshie, 72, Hutcheson Street, Glasgow.

Dissolutions of Partnerships.

HUTCHENCE & COOPER, Liverpool, watch manufacturers. Jan. 22.

SCHOERLE & COCKRAM, Spencer Street, Clerkenwell, goldsmiths and jewellers. Jan. 31. Debts by Gottlieb Schoerle.

BOWEN, J. & G. Summer Row, Birmingham, plated goods manufacturers. March 3. Debts by Jonas Bowen.

BAKER & ALLAN, 15, George Street, Birmingham, electro-platers.

WHITELAW, JAMES, West Register Street, Edinburgh, watch and clock maker. The business continued by Charles Jardine.

NAYLOR & CLARK, Vittoria Street, Birmingham, electro plate manufacturers.

ROSKELL, WILLIAM & Co., 21, Church Street, Liverpool, chronometer and watch manufacturers. Jan. 29. Debts by Richard Roskell.

Distribution of Assets.

HORTON, FREDERICK, 80, High Street, Whitechapel, and 572, Mile End Road, jeweller, died Jan. 12. Claims by June 1 to C. Gatliff, 8, Finsbury Circus, sol.

WEBBER, JOHN, Powis Street, Woolwich, silversmith, died Feb. 6. Claims by May 22 to Farnfield & Sampson, 21, Queen Victoria Street and Woolwich, sols.

Last Days for Lodging Claims.

REYNOLDS, ELLIS, (Liq.), 202, Bishopsgate Street, Without, silversmith. Claims by May 15th to Henry Holland, 16 Crescent, Jewin Street.

Meetings.

McKENSEY, ROLAND and WILLIAM TYTHERLEIGH, trading as McKENSEY and Co., (Bkt.), 59, Hatton Garden, electroplate manufacturers. At Bankruptcy Court, Lincoln's Inn-Fields, May 8 at 11, exam.

RITCHIE, WILLIAM, (Liq.), Coxhoe, Durham, watchmaker. At J. S. Smirk's accountant, Collingwood Street, Newcastle, May 7, at 3. For appointing a trustee in place of T. Pyle, deceased.

Applications for Discharge.

WATT ROBERT D., Elgin, watchmaker, April 25.

Trustees Deeds Granted.

MITCHELL WILLIAM, Catrine, watch and clock maker. Claims with Brown, jun., Davies and Tait, 65, Regent Street, Glasgow, accountants, by May 7.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

1451. JOSEPH GEORGE ROLLASON, of the firm of Rollason, Wood & Co., Stampers, Piercers, and Fancy Chain Manufacturers, of Birmingham, in the county of Warwick, for an invention of "Certain improvements in solitaires and other like fastenings."—Dated 13th April, 1877.
1511. ALBERT BARKER, of New Bond Street, in the county of Middlesex, Dressing Case Maker and Silversmith, for an invention of "Improvements in keys for locks, latches, watches, clocks, and other like articles, applicable also to cocks or taps."—Dated 18th April, 1877.
1522. HENRY STUART, of Liverpool, in the county of Lancaster, Watch Manufacturer, and GEORGE DANIELS, of the same place, Watchmaker, for an invention of "Improvements in mechanism for winding and for setting the hands of keyless time-keepers."—Dated 19th April, 1877.
1579. JOHANN ANTON BENEDICT VON CASTELBERG, of 58, Holborn Viaduct, in the city of London, for an invention of "Improvements in calendar watches."—A communication to him from abroad by Fritz Petitpierre, of Chaux de fonds, Switzerland.—Dated 23rd April, 1877.
1624. JOSEPH GEORGE ROLLASON, of the firm of Rollason, Wood & Co., Stampers, Piercers, and Fancy Chain Manufacturers, of Birmingham, in the county of Warwick, for an invention of "Improvements in sleeve-links and other dress-fasteners, which improvements are also applicable to other purposes."—Dated 26th April, 1877.
1639. HENRI ADRIEN BONNEVILLE, of the British and Foreign Patent Offices, 18, Rue de la Chaussée d'Antin, Paris, France, and 6, Piccadilly, in the county of Middlesex, Patent Agent, for an invention of "Certain improvements in self-recording thermometers, hygrometers, and other instruments of a similar nature."—A communication from Robert Kirk Boyle, a person resident in the city, county, and state of New York, United States of America.—Dated 26th April, 1877.

Notices to Proceed.

455. HENRY PERCY HOLT, of Royal Insurance Buildings, Leeds, in the county of York, Civil Engineer, and WILLIAM DENISON, of West Street, Leeds, in the county of York, Engineer, have given notice in respect of the invention of "Improvements in fire and burglar proof safes, more particularly in connection with shop windows, and in the apparatus connected therewith."
5002. WILLIAM ROBERT LAKE, of the firm of Haseltine, Lake & Co., Patent Agents, Southampton Buildings, London, has given notice in respect of the invention of "An improved machine for engraving and chasing jewellers' and silversmiths' work, and for other like purposes."—A communication to him from abroad by Albert H. Watkins and Frederick A. Brown, both of Boston, Massachusetts, United States of America.

Grants of Provisional Protection for Six Months.

1329. To HENRY CHARLES TAYLOR, of the firm of Robert Walter Winfield & Company, of Birmingham, in the county of Warwick, Merchants and Manufacturers, for the invention of "Improvements in ornamenting metals and in tools to be used for that purpose."
1122. To GEORGE BLUNT, of 24, Augusta Street, Birmingham, in the county of Warwick, Jeweller, for the invention of "Improvements in fastenings for solitaire sleeve studs, and other articles of a similar kind." On his petition, recorded in the Office of the Commissioners on the 21st day of March, 1877.
1403. To SAMUEL HUGHES MCCLELLAN, of Deptford, in the county of Kent, Watch Maker, for the invention of "An improved escapement for clocks and other time-pieces."

Patents Sealed.

4297. DAVID CUTLER, of Birmingham, in the county of Warwick, Manufacturer, for an invention of "Improvements in solitaires, sleeve links, shirt, collar, and other studs, and other similar dress fastenings and ornaments."—Dated 7th November, 1876.
4037. GEORGE GREEN, of Birmingham, in the county of Warwick, and JAIME MALLOL, of the same place, for an invention of "Improvements in mounting electro-plate wares, such as waiters, side dishes, 'butters,' cake baskets, and other articles of a similar kind."—Dated 19th October, 1876.
883. GEORGE BETJEMANN, GEORGE WILLIAM BETJEMANN, and JOHN BETJEMANN, all of 36 and 38, Pentonville Road, in the county of Middlesex, Desk and Dressing Case Manufacturers, for an invention of "Improvements in the construction of dressing cases, jewel cases, game boxes, and spirit and other cases."—Dated 5th March, 1877.
4351. GEORGE WALKER, of Birmingham, in the county of Warwick, Gilt Toy Manufacturer, for an invention of "Improvements in the construction of solitaires, shirt studs, and other such like fastenings."—Dated 3rd November, 1876.
4261. WILLIAM WIGGINS, of Stanmore Street, Caledonian Road, London, Goldsmith, for an invention of "Improvements in the manufacture of watches, to prevent robbery by breaking the bows thereof."—Dated 4th November, 1876.

Patents on which the Stamp Duty of £50 has been Paid.

1662. GUSTAVE LUCE, of the firm of Luce, Son, & Rozan, of Marseille (France), Manufacturers, for an invention of "An improvement in process of and apparatus for desilvering and refining lead."—Dated 11th May, 1874.

Patents which have become Void.

955. HARRY BARRETT, of 2, Brecknock Road, Camden Road, in the county of Middlesex, for an invention of "A new or improved detachable spring brooch back."—Dated 18th March, 1874.
994. JOHN READING, of Harborne, in the county of Stafford, Gentleman, for an invention of "Improvements in attaching or connecting ornaments to collar and other studs, solitaires, and other dress fastenings and articles of jewellery."—Dated 21st March, 1874.
914. JOHN ALEXANDER LUND, of the firm of Barraud and Lund, of Cornhill, in the city of London, Manufacturers, for an invention of "Improvements in keys for watches, and other pocket time-keepers, and in the time-keepers to which they are applied."—Dated 29th March, 1870.

Patents Granted in British Colonies and Dependencies.

CANADA.

6816. ROBERT BARCLAY, of Paris, Ont., for "Improvements on escapements. (Perfectionnements aux échappements.)—5 years.—Dated 24th November, 1876.

Patents Granted in Foreign States.

FRANCE.

- 115,512. BAILLY, of Morez, for "Improvements in the manufacture of weldless mountings of temple spectacles and folders of iron, steel, copper, and German silver."—Dated 19th November, 1876.
- 115,563. LUND, for "A chronofer or telegraphic clock-regulator."—Dated 17th November, 1876.
- 115,584. CARPENTER & MARTIN, for "Improvements in clocks and other time-pieces."—Dated 18th November, 1876.
- 115,601. MAUNIER & VERNIERS, of Paris, for "A jointed bracelet with facets."—Dated 20th November, 1876.
- 115,607. SCHWOB JEUNE, of Paris, for "A regulator balance for watches."—Dated 20th November, 1876.
- 115,630. GIF & Sons, for "A safety-staple for watches."—Dated 21st November, 1876.
- 115,663. LION, for "Bracelets."—Dated 22nd November, 1876.
- 115,695. LOGETTE, of Ay, for "Transparent enamel for protecting leaves of tin, silver, gold, paper, capsules, &c."—Dated 30th November, 1876.
- 115,697. MICHAUX, for "A clasp for cravats, as patented 18th May, 1876."—Dated 2nd December, 1876.
- 115,711. BOURGUET, for "Clock-work."—Dated 27th November, 1876.
- 115,725. HESSEL, of Paris, for "Metallurgic treatment of oxydized nickel-ore by the dry way."—Dated 25th November, 1876.
- 115,733. MALLET, for "Jointed fastenings for collars, cravats, shirt-fronts, &c."—Dated 27th November, 1876.
- 115,737. PLICION and THUAT, for "A portable and oscillating filter-crucible with a heat-generator, back-fire and parachute twyer for smelting metals in general."—Dated 27th November, 1876.
- 115,738. PREVOST & DUPRIEZ, of Paris, for "A machine for edging plate-metal."—Dated 27th November, 1876.
- 115,746. CHUPIER, of Paris, for "Fastenings for bracelets, belts, clasps of cloaks, &c."—Dated 30th November, 1876.
- 115,747. CLEMENT, Sons, of Paris, for "Studs for cuffs."—Dated 29th November, 1876.

AUSTRIA.

112. E. REILL, of Linz, for "Manufacturing jewellery of coloured plated gold.—1 year.—(Secret.)—Dated 7th December, 1876.

Designs Patented in the United States.

9416. OSCAR M. DRAPER, of North Attleborough, Mass., for "Ornamental chain-links."—Application filed 24th April, 1876.—Term of patent 14 years.
9483. VIRGIL DRAPER, of North Attleborough, Mass., assignor to Oscar M. Draper, of the same place, for "A watch and other chain swivels."—Application filed 13th June, 1876.—Term of patent 14 years.
- 182,305. E. C. COVELL and M. M. ROBINSON, of Laconia, N.H., for "Lock-work attachments for clocks."—Application filed 4th March 1876.
- 182,358. A. F. CURPEN, of Plymouth, Ohio, for "Watch-balances."—Application filed 20th June, 1876.
- 182,360. NUMA J. FELIX, of New York, N.Y., for "Watch-case springs."—Application filed 28th August, 1876. *Claim.*—"The combination with a sliding and adjustable watch-case spring, of a bearing or bridge piece, that is secured to the case and fitted by downward-extending perforated end posts or lugs to the seat of the case, substantially in the manner and for the purpose specified."
- 182,392. ALBERT TROLLER, of San Francisco, California, for "Stem-winding devices for watches."—Application filed 13th July, 1876.

THE WATCHMAKER, JEWELLER, SILVERSMITH, AND KINDRED TRADES' DIRECTORY.

The important feature of our Directory Columns will be found to be a most effectual method of keeping the Names of Firms and Manufacturers before the constant notice of the Trade.

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NEGRETTE & ZAMBERA, Holborn Viaduct, E.C.; Charterhouse Street, E.C.; 45, Cornhill, E.C.; 122, Regent St., W.
WEBSTER, J., 68, St. John Street Road, Clerkenwell, E.C.

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CHATWOOD'S, 120, Cannon Street, E.C., and Lancashire Safe and Lock Works, Bolton.
GEEING & TALBOT, Apollo Safe Works, Moseley Street, Birmingham.
PHILLIPS & SON, Speedwell Works, Sherborne Street, Birmingham.
THE SICKER SAFE AND STRONG ROOM COMPANY, LIMITED, Soho, near Birmingham.
WHITEFIELD (F.) & CO., Whitefield's Patent Screw Bolt and other Safes, Viaduct Works, Oxford Street, Birmingham.

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MAYER A. & SON, 122a, Aldersgate Street, London, E.C. Importers of American, French, German, and Cuckoo Clocks, Materials, &c.

CLOCK MAKERS.

BRUGGER & STRAUB, 79, High Holborn, W.C.
CAMERER, KUSS, FRITSCHLER, & CO., 522, Oxford Street, W.C., and 2, Broad Street, Bloomsbury, W.C.
COHEN (JACOB) & CO., 36 and 37, Ely Place, E.C., and Charterhouse Street, E.C., London; and 10, Rue Béran-ger, Paris.
GILLET & BLAND, Steam Clock Factory, White Horse Road, Croydon. Exhibition Medal, 1873. Makers (to her Majesty's Government) of Worcester Cathedral Chimes at Bradford and Rochdale Town Halls, Boston, St. Stephen's Church, Hampstead, &c.; and of Clocks of every description; also patent Carillon Machines. Sole Proprietors and Makers of Patent No. 4141, for improvements in Church and other Bell Music. Established 1844.
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SWINDEN & SONS, 27, 28 & 29, Temple Street, Birmingham.

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HUTTON & CO., 5 and 6, Newgate Street, E.C., and Phoenix Court, Newgate Street, London, E.C.

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WILLIAMSON, HENRY, 85, Old Street, St. Luke's, London, E.C.

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CLEMENTS, HANDLEY & Co., Dealers in all kinds of Tools and Materials, Stones, Pastes, Cases, &c., 19, St. John's Square, Clerkenwell, E.C. (See advertisement).
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WATCH CAP MAKER.

BAKER, WILLIAM, 10, Meredith Street, Clerkenwell London, E.C.

WATCH CASE MAKERS.

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don, E.C.
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well Road, London, E.C.
STRAM, ALFRED, 12, Ashby Street, London, E.C.

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MEREDITH (WILLIAM) & SON, 260, Goswell Road,
London, E.C.
SAGGERSON, ROBERT, Wheel Cutter and Dealer in
Watch Materials, Files, Tools, &c., Prescott, Lancashire.
SWINDEN & SONS, 27, 28 & 29, Temple Street, Bir-
mingham.
THOMAS, WILLIAM, 7, Great Sutton Street, Clerken-
well, London, E.C.
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A MONTHLY TRADE JOURNAL,

Devoted to the Interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades.

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HOROLOGY. (Continued.)

XXIV.—ON THE MEASUREMENT OF TIME.

THE time allotted to man is short, and he has every interest in keeping a good account of it! But we need not look so high in order to discover the vast importance of measuring time. The study of the earth and the heavens, many of the researches in the laws of the universe depend upon it, and in civilized life a multitude of usages and habits are attached thereto. No wonder, therefore, that man should have set himself the task of attaining the utmost regularity and precision in its measurement.

To measure a quantity is to divide it in equal parts; therefore, to measure time is to divide its duration into equal intervals. Men in the most ancient times felt the want of such a division, and, as was natural, looked for the means in the periodical phenomena of nature, particularly in that striking succession of day and night. But the variation of these periods according to season could not fail to be perceived, and it was soon recognized, that to have anything like a reliable basis the interval between noon and noon must be taken.

So the "astronomical day" became the standard by which to form the longer periods of months and years, and the day was subjected to a further division of twenty-four shorter intervals called hours. The Egyptians are credited with this division as well as with the method of determining precisely the instant of noon. Yet this subdivision of the astronomical day into twenty-four hours did not penetrate into civil life; and we find the Greeks and Romans limit themselves to a division of the "natural day"—

interval between the rising and setting of the sun—in twelve hours of uniform duration for the same day, but necessarily varying from day to day. This subdivision of the day was effected simply by observing the movements of the sun, "Sun dials and gnomons," which in Greece date back to great antiquity, did not find their way to Rome till towards the end of the fifth century, after the foundation of that city. Ingenious as this invention was, it only partly answered its object, because it offered no means of measuring the time whenever the sun was not on the horizon or hidden by clouds. It was evident that natural phenomena alone could not be depended upon to obtain the desired division at any time, and that artificial agents must be resorted to.

The first instruments invented for this purpose were based on the principle—that a certain quantity of water or sand *always* requires the same time to run from a vessel containing it into another one beneath, and connected with the first by a narrow orifice. The invention of these mechanical timekeepers, which went under the name of "Clepsydra," is perhaps older than the sun-dials, and it was made use of long after the construction of proper clocks. In this primitive form, the clepsydra was far from offering the required exactitude, and inconvenient besides, as it had to be turned over after the lapse of each interval it indicated. To evade this inconvenience and to improve the system generally, larger quantities of water were employed, and a kind of "floater" was put in the surface of the liquid in the lower vessel. This floater was again in communication with a wheelwork, and the gradual rising of the water level, caused the movement of the mechanism, which was at first believed to be regular; but the running off of the liquid was soon found to be anything but uniform.

On this principle, all the water-clocks were probably constructed, the oldest of which, described by "Vitruvius," are ascribed to

two geometricians of the "Alexandrine school"—"Ctesileius" and his pupil "Heronius." (We gave a minute description of "Ctesileius' Clepsydra" in Vol. I., No. 5, of this Journal.) They both lived towards the end of the second century B.C. Their construction presupposes an acquaintance with "teethed wheels," in fact, the latter invention is attributed to the celebrated "Archimedes," who lived about a century before the last-mentioned philosophers, and by some, to Aristotle who again precedes Archimedes' period. During the first ten centuries, water clocks were the only time-keepers known, and we have a very imperfect idea of their construction. What we know is, that they were very complicated, and that besides the indication of hours, they executed many curious movements. They were works of very great rarity, and the names of their makers were handed down to posterity. History has transmitted to us, among others, those of "Boëtius" and "Cassidorius," two men who were the warmest supporters of progress, at a time when literature, arts, and sciences were on the decline.

Towards the eighth century, the Pope, Paul I., sent one of these clocks to "Pepin le Bref;" and at the commencement of the ninth the celebrated caliph, "Aroun-al-Raschid" made a similar present to "Charlemagne."

From the remotest antiquity to the tenth century of our era, the measurement of time was, therefore, founded on the march of the solar shadows and the imperfect uniformity of the running off of liquids or sand.

A new career was opened to the art, by the introduction of another motive power. This new motor was a weight, moving the wheelwork of the clock by its own downward motion. It is difficult to state the exact time when the weight was first applied for this purpose. Some historians give the honour of constructing a clock on this principle to Gerbert, who in 999 mounted the pontifical throne, under the name of Sylvester II., but this is denied him by others, and the construction of several clocks with weights in different countries, descriptions of which have come down to us, dates only back to the fourteenth century.

Yet this new motor would not have offered any more regularity than the running off of liquids if it had not been assisted by another contrivance. A weight attached to the end of a cord, which has been wound on a cylinder forming part of the wheelwork of the clock, will no doubt descend, if not held up, winding off the cord, and so impart a rotatory movement to the cylinder and wheelwork. But this movement is subject to the laws of gravitation, and according to them it would accelerate in descending. We trace, therefore, to the introduction of weights, also the first use of the pendulum, regulating the descent by alternative oscillations, and connected with the wheelwork by that admirable mechanism, called the crown escapement.

Let us pause here a moment and consider the immense progress which horology has made in four centuries (from the 10th to the 14th). The skilled mechanic of our day can hardly abstain from smiling, when he glances at one of the imperfect works of our first inventors. When he looks upon the rude wheelwork of this movement, which he executes now with such fineness and the complicated and insufficient means to surmount some obstacle, which he evades by a simple and easy process, a feeling of superiority will involuntarily manifest itself. But a little more reflection will render him more just to these first labours, and if he can carry back his thoughts to the period when they were performed, he will as much admire as he despised them before. We cannot refuse this tribute of admiration to those who first abandoned the clepsydres, and constructed clocks moved by weights and regulated by escapement and pendulum.

The rudeness of construction and the insufficiency of a pendulum without a spiral certainly strike us, but it must not be forgotten that they were the foundations of modern horology and that mechanical genius based its labours on those first principles. Unfortunately, we know not on whom to bestow our gratitude, as the darkness of the middle ages hides the names of those ingenious men who opened such a brilliant career to their successors.

The fourteenth century, as already stated, offers us several clocks constructed on the same principle, works of mechanicians of different countries, as Wallingford in England, Dendis in Italy, De Vik in Germany, etc. Nine of these clocks indicated the hours only, several of them showed the days, months, phases of the moon, feasts of the year, etc. De Vik's clock seems to be the first with bells. It is worthy of remark, that the various researches and discoveries which characterize this epoch, were not, as in our days, encouraged by the increasing demands of science. It was not the astronomer and geographer that longed for more precision and additional convenience, and spurred on the clockmaker in his endeavours to perfect his machine. The exigencies of monastic life

appear to have given the impulse to the principal discoveries. The wish to know the hours of religious offices during night, independent of the stars, and to be summoned at those hours if asleep, was the incentive to the invention of the clock, the bell-clock, and later the alarm. Several of the mechanicians we have mentioned were monks.

This new career to horology had hardly begun when the want to possess portable clocks made itself felt. But while weights were used as a motor, any change in the position of the clock was impracticable; besides it would always require considerable space. This difficulty was, however, overcome, when some genius hit upon replacing weights by a force of spring. An elastic steel blade rolled firmly together answered this purpose by its tendency to unroll itself. With this new principle of imparting movement, the watch was invented. The mechanism could be reduced to a small compass and acted nearly alike in all positions. The mechanicians who first applied these important modifications to clocks, are no better known to us than the inventors of the escapement and pendulum. Even the time of the discovery remains uncertain, it is supposed to be about a century and a half after the invention of the large-weight clocks. We find the first models of the latter in the fourteenth and of the first watches or portable clocks in the sixteenth century. But we know for certain that watches were worn at the court of France under Charles IX. and Henry III. Several of them have been preserved, and are of different forms, curious workmanship, and run for several days. England seems to have been in advance of the Continent, as Derham states he saw a watch of this description belonging to Henry VIII.—*Journal Suisse d'Horlogerie*.

(To be continued.)

TRADE ITEMS.

IN Glashutte, Saxony, a manufacturer employs an aluminium in the production of watch springs. The new springs have the advantage over the old in not being subject to rust, in not being magnetic, and in possessing greater hardness and elasticity.

A MAGNIFICENT vase, four feet high, has been sent to the Mikado by the Emperor of Russia.

THE treasures of Mycenæ discovered by Dr. Schliemann are soon to be placed in the Polytechnicon at Athens, under the auspices of the Archæological Society of that city, where they will be easily accessible.

DR. BENJAMIN FRANKLIN invented and constructed three clocks, and one of them is owned in the Old King's Arms Inn in Lancaster. It has only three wheels and strikes the hour. It is to be sold at auction with other curious historical objects.

THERE is in Paris a vast establishment, the most extensive of its kind in the world, where the imitation of pearls, diamonds, and precious stones generally, is carried on with all the skill which modern ingenuity renders possible. The sand upon which the whole art depends, is found in the forests of Fontainebleau. False pearls are lined with wax and scales of the roach and dace, which have to be stripped from the fish while living, in order to retain the peculiar glistening hue. The setting is always of real gold and the fashion of the newest kind.

A PARIS journal announces the arrival of the Director of the New York Observatory to exhibit a new telescope, three times as powerful as any hitherto employed. Commenting on this, it says:—"Encore un peu on comptera les trous faits à la lune"—In a little while we shall count the holes in the moon.

THE pigeon fan is the latest French novelty in this class of goods. The head and breast of the bird is stuffed and dressed, and the spread wings form the "fan." These are mounted on ivory handles. All the natural colours of the pigeon are preserved, and those in shaded browns or black and white are exceedingly effective. They are decidedly the prettiest fans of the season.

PRIZES FOR ENAMEL, ALLOYS, &c.—Among the prizes offered by the German "Society for the Promotion of Industry," are the following:—(1) A silver medal, or its value, and £45 for an opaque red enamel for gold, silver, copper, and bronze. (2) A gold medal, or its value, and £150 for a substitute for caoutchouc, the same for a suitable substitute for gutta-percha. (3) A prize of £50 for a concise, critical and practical treatise on cements; also £75 for the best investigation of the cause of a change in the zero point of thermometers, with a method of preventing or remedying it. (4) A prize of £100 for the best series of iron and manganese alloys, at least twenty samples to be prepared, containing from 0.5 to 5 per cent. of manganese.

CURIOSITIES OF CLOCKS AND WATCHES.

(Continued from page 270.)

THE International Exhibition of 1862 contained, among other articles of horology, a reversible chronometer, a chronometer showing the day of the month, a reversible, and a self-winding watch. John Bailey, or Jack Bailey, as he was commonly called, was the chief promoter of the once fashionable acquirement of driving four-in-hand. He bequeathed to Sir Henry Peyton, the second baronet, who died in 1854, his silver watch, the regulator in all his journeys between the "George and Blue Boar," in Holborn, and the "Angel" inn, at Oxford.

Sir William Lockyer Freestun, of Belvidere, Weymouth, Dorsetshire, who died on April 16th, 1862, aged 57, bequeathed to Lord Palmerston a watch and appendages worn by the testator, and which he requested that his lordship would do him the honour to accept. An enamelled gold snuff-box, with a watch movement and diamond hands, was sold by auction, by Messrs. Debenham and Stoir, on October 18th, 1865, for twenty-four guineas.

Mr. J. T. Pickburn, a gentleman who is well known among, and respected by, the people of Clerkenwell, the great watchmaking centre, drew the following simile in a speech made by him at a public dinner in 1865, at which many horologists were present:—"That the excellent contrivance called the British Constitution, is like a watch that goes upon a diamond, John Bull's pocket being the mine from whence the metallic substance is derived that forms the mainspring. The House of Commons is the regulator; the House of Lords the balance wheel; the Ministers the wheels within wheels; and that other estate of the realm, the Press, does duty as the dial, by which we learn how the time goes. But the jewel upon which the whole fabric turns is the Sovereign."

Mr. Benson, the eminent clock and watch maker of London, has within the last few years, invented an instrument called a chronograph, which is chiefly used for timing the duration of horse-races. It consists of an ordinary quick-train lever movement, on a scale sufficiently large to carry the hands for an eight-inch dial, and with the addition of a long seconds-hand, which traverses the dial, instead of being, as usual, just above the figure VI. The peculiarity of the chronograph consists in this seconds-hand and the mechanism connected with it. The hand itself is double, or formed of two distinct hands, one lying over the other. The lower one, at its extreme end, is furnished with a small cup or reservoir, with a minute orifice at the bottom. The corresponding extremity of the upper hand is bent over so as to rest exactly over this puncture, and the reservoir having been filled with ink of a thickness between ordinary writing fluid and printers' ink, the chronograph is ready for action. The operator, who holds tightly grasped in his hand a stout string connected with the mechanism peculiar to this instrument, keeps a steady look out for the fall of the starter's flag. Simultaneously, therefore, with the start of the race, the string he holds is pulled by him, and at the same moment the upper hand dips down through the reservoir in the lower, and leaves a little dot or speck of ink upon the dial. This is repeated as the horses pass the winning post, so that a lasting and indisputable record is afforded by the dots in the dial of the time exact to the tenth of a second, which is occupied in running the race. As an example of the results of this instrument's operations, we may add that it timed the start and arrival of the Derby race in 1866 as follows:—start 3 hours, 34 min.; arrival, 3 hours, 36 min., 49 secs.; duration of race, 2 min. 49 secs.

Charlotte Florentia, Duchess Dowager of Northumberland, by her will, proved on September 28th, 1866, bequeathed to Lady Williams her diamond watch, the chain of diamonds and pearls belonging to it, and the seals.

We now propose to give a short account of some of the curiosities of the mechanical details of watches. A good three-quarter-plate watch as usually made requires no fewer than one hundred and thirty-eight distinct pieces in its frame, train, escapement, potence, fuses, arbors, clicks, ratchets, and other nicely contrived and adjusted constituents. To these appliances must be added the chain, which contains sixty-three links and forty-two rivets to every inch, and being generally six inches in length comprises six hundred and thirty pieces; thus swelling the contents of a common detached lever watch to seven hundred and sixty-eight separate pieces, to construct which give occupation to no less than thirty-eight or forty different kinds of artificers. Babbage, in his "Economy of Manufactures," tells us that the division of labour cannot be successfully practised unless there exist a great demand for its produce; and it requires a large capital to be employed in those arts in which it is used. In watchmaking it has been carried, perhaps, to the

greatest extent. It was stated in evidence before a Committee of the House of Commons, that there are a hundred and two distinct branches of this art, to each of which a boy may be put apprentice; and that he learns only his master's department, and is unable after his apprenticeship has expired, without subsequent introduction to work at any other branch. The watch-finisher, whose business is to put together the scattered parts, is the only one out of the hundred and two persons who can work in any other department than his own.

(To be continued.)

MIRROR OF THE MONTH.

JUNE.

OVID, in his "Fasti," makes Juno claim the honour of giving a name to this month; but there had been ample time before his day for an obscurity to surround the origin of the term, and he lived before it was the custom to critically investigate such matters. Standing as the fourth month in the Roman calendar, it was in reality dedicated a *Junioribus*—that is, to the junior or inferior branch of the original Legislature of Rome, as May was a *Majoribus*, or to the superior branch. Romulus assigned to this month a complement of thirty days, though in the old Latin or Alban calendar it consisted of twenty-six only. Numa deprived it of one day, which was restored by Julius Cæsar, since which time it has remained undisturbed.

Though the summer solstice takes place on the twenty-first day, June is only the third month of the year in respect to temperature, being preceded in this respect by July and August. The mornings, in the early part of the month especially, are even liable to be frosty, to the extensive damage of the buds of the fruit trees. Nevertheless, June is the month of greatest summer beauty, the trees are in their best and freshest garniture. "The leafy month of June," Coleridge well calls it, the month when the flowers are richest in hue and profusion. In English landscape, the conical clusters of the chesnut buds, and the tassels of the laburnum and lilac, vie above with the variegated show of wild flowers below. Dr. Aiken says justly that June is in reality, in this climate, what the poets only dream May to be. The mean temperature of the air was given by an observer in Scotland as 59° F., against 60° for August, and 61° for July.

The sun, formally speaking, reaches the most northerly point in the zodiac, and enters the constellation of cancer, on the 21st of June; but for several days about that time there is no observable difference in his position or his hours of rising and setting. At Greenwich he is above the horizon from 3.43 morning to 8.17 evening, thus making a day of 16h. 26m. At Edinburgh the longest day is about 17½ hours, and there is a glow equal to dawn in the north through the whole of the brief night. In Shetland, the light at midnight is like a good twilight, and the text of any ordinary book may then be easily read.

June was the month which the Romans considered the most propitious season of the year for contracting matrimonial engagements, especially if the day chosen were that of the full moon or the conjunction of the sun and moon. Wedding rings in those days did not occupy the present prominent position; but a considerable sum of money was anciently put into a purse or plate, and presented by the bridegroom to the bride on the wedding night, as a sort of purchase of her person. This custom was common to the Greeks as well as Romans, and seems to have prevailed among the Jews and many Eastern nations. It was changed in the Middle Ages, and in the north of Europe, for the "morning present;" the bride having the privilege, the morning after the wedding day, of asking for any sum of money or any estate that she pleased, and which could not in honour be refused by her husband. The demand at times became really serious if the wife were of an avaricious temper. Something similar prevailed in England under the name of the "Dow Purse." A trace of this is still kept up in Cumberland, where the bridegroom provides himself with gold and crown pieces, and, when the service reaches the point, "With all my worldly goods I thee endow," he takes up the money, hands the clergyman his fee, and pours the rest into a handkerchief which is held by the bridesmaid for the bride. When Clovis was married to the Princess Clotilde, he offered, by his proxy, a sou and a denier, which became the marriage offering by law in France; and to this day pieces of money are given to the bride, varying only in value according to the rank of the parties.

GOLD.

(Continued from page 273.)

MOSES STRINGER also says, "Gold, silver, and quicksilver, have been largely produced in Great Britain and Ireland. Gold hath been, and may now be found in the hills of Mendip, in Somersetshire, called the Golden Rake. In certain rivers in Scotland, and in Ireland, good gold, in perfect form, like to the Arabian gold, and collected the same way—after heavy rains." But Sir John Pettus, in his "Fodinae Regales," states that all the gold and silver obtained in England was procured by extraction from other metals, and *not* from mines of perfect gold and silver, and this seems to have been the case. The metals, or ores of metals from which gold is obtained in Britain, are copper, lead, silver, iron, and zinc; and this fact no doubt led to the Crown originally laying claim to *all* mines and minerals.

With regard to Moses Stringer, he lived in the reigns of William III. and Mary, and of Queen Anne. He seems to have been an extraordinary man in his time, and one to whom no speculation came amiss. In 1703, we find him "Mineral Master General and Chancellor of the Mines Royal Company;" Deputy governor in 1705; treasurer in 1709, and subsequently governor. His son, Hermes Hippocrates Stringer, filling the post of "Principal Registrar," and secretary to the aforesaid chancellor. An amusing account of some of his speculations and theories will be found in his "Opera Mineralia Explicata," also in his "English and Welsh Mines and Minerals," which will amply repay perusal, as giving an idea of the time in which he lived. We have before mentioned that "The Mines Royal Company" claimed not only the right to gold and silver, but also to the baser metals. Moses Stringer had therefore a fine field for speculation, and we find various proposals to the Government for co-operation in all sorts of schemes. One was for raising the price of tin, (1) "Because the publick use of *silver plate* is so much *abated* in the nation." (2) "Because tin, improved by art, is next in nature to pure gold and silver, and it is to the interest and honour of the nation to refine tin, it being our own commodity, rather than to use allayed and coarse silver for common plate." (3) "The higher the price and quality of tin shall be, the more it will be in fashion; the more it is in fashion; the more it will be refined, the more it is refined, the more fitter it will be for plate; the more tin there is in plate, the more silver we shall have in money; the more silver there is in money, the more money we shall have to lay out on the most refined and fashionable pewter; the greater the consumption is, the better it will be for rich and poor. The poor will get more wages, and the rich more wealth! For *all markets are governed by the first market price*. And as the quantity, quality, and price of tin shall rise, the more it will be for the honour and interest of the nation in general, and the counties of Cornwall and Devon, in particular, will be the better enabled thereby to serve their king and country, in mind, body, and estate."

He continues, "And, farther to show the nature of our tin (and I could give many such instances), I shall inform my reader that about 20 years ago, some engineers, or rather, men of cunning art, came down into Cornwall; and often visiting the blowing or melting houses of the tin, and as often making the *blowers drink*; whilst the blowers were busy drinking, those cunning men were as busy dipping their rods in the flote, or mould, where the tin was melting hot; and by that means, using *both* ends of their rods, they extracted a great deal of *gold and silver*, and, if they had not been mistrusted and forced to fly the country, upon the *discovered want of that virtue*, which by that means was taken out of the tin, they would have gotten many thousand pounds, in a little time, and spoiled all the tin which they should so touch. The pewterers and merchants upon the discovery, complaining to the tinnors, the tinnors brought their action against the blowers; and (after a stannary law suit as long as from hence to the Land's End) they had more satisfaction than (I think) should have been given them. And sometime since, one of those cunning men confessed the matter of fact to me, and how they were forced to fly the country for committing it."

Stringer adds, "The improvement of this rich talent will much increase our coin, which is so much wanting to carry on a vigorous war against our greatest adversary. And as all kingdoms and commonwealths have risen by trade and justice, so may we now begin to aggrandise this great land and nation by one of the capital commodities thereof. And when the great wisdom and policy of the king and parliament shall think fit to sit upon so great and advantageous a work, even an English kitching, hung (as it were) with refined pewter plate, will be one of the finest and noblest sights in the world." He remarks, "A well managed trade is the creator and preserver of money, and money and trade are the *sinews of war*."

Another "Proposal to the Honourable House of Commons" is "For employing the Poor to Gain the Hidden Treasures of this Kingdom," so as to increase the royal revenue a million a year, the wealth of the nation *many* millions, and give opportunity to establish as strong forces at land, *without charge*, as the nation may require; strengthen the fleet, and *occasionally* suppress vice!! Stringer remarks, "But I expect these will meet with opposition from four sorts of men (but I doubt not but the wisdom of this Honourable House will protect it), viz. (*Imprimis*), Those that are biassed against the present Government, because it will be of such *great* benefit to the *Crown*. (2) The Dog in the Manger, or those that had rather the riches underground should lie obscure to eternity, because their sense and purse cannot gain them, rather than any other should gain something, so well as they, by raising them. (3) The envious, that are always angry that anything should go on but what they are the proposers of, or at least have a great hand in. (4) Of as ill consequence are those who are ignorant of the subterraneous productions and their managements, but if any of these raise any objections worth debate, I doubt not but to answer them fully, if permitted thereto." He then enumerates the known gold and silver mines, and continues, "I am sure your Honours know that if *sheeps' blood*, with a few *skins and hides*, can make such profitable manufacturers, these many *rich* subterraneous productions, with due management, will scarcely fail to make *London* so plentiful as *Jerusalem* was in King *Solomon's* time."

His project was that all mines, minerals, and waste lands should be worked by those poor who were dependent on their parishes for relief, and that the poor rates, which then annually amounted to £1,500,000 sterling, should be paid into the treasury of the "Mines Royal Company" for the management of the mines—rather an ingenious idea for his own benefit. He says, "200,000 strong men will be fully employed in this affair, besides women and children; and those that want a leg or an arm, or some eyesight, may be useful in picking, sorting, knocking, dressing and washing *ores*, and what part of these 200,000 men the House of Commons may approve of may be added under the same Lieutenantancy as the Militia is, and exercised on those days that miners keep as holidays. 200,000 horse will be employed in carrying *ores* to the mills, water to the mines, the metals and minerals to the store-houses and markets, &c.; and these, some regard being had to their sizes, may be exercised as *dragoons*, and civilized with the other by regular martial laws. These will be a trusty, valiant and hardy army of Englishmen if an invasion happen, and their arms and accoutrements reserved in the secure custody of the respective Lieutenants."

All criminals were also to be sent to work in the mines, thus doing away with the expense of gaols, &c. "None of the poor," he says, "need be compelled to the working against their wills in the mines, because the work is not very hard, and 10d. a day for a man, 6d. for his wife, and 4d. for his children, from 8 to 14 years old, makes it, if he have but two children, 14s. per week; out of which he may *well* live in those countries, and save money to buy cattle. And for this they may work industriously there six or eight hours, which is usually a miner's day's work. Men and women that want a leg or an arm can serve to tell *noses*, and see that others appear at and follow their work," &c.

Though amused at his eccentricities, we cannot help acknowledging that Stringer possessed considerable talent, and a wonderfully far-seeing and comprehensive brain. In fact, he seems to have been a born speculator; at one time originating schemes of the greatest magnitude, at another entering into the pettiest details. In one of his prospectuses we read, "The said Mineral Master General will furnish the said industrious workmen, &c., with raiment and necessities for household goods, at prime cost, and much cheaper than they can buy for ready money. For example, a good fashionable hat, 2s. 6d.; his wife, a fashionable gown and petticoat for 13s. or 14s. N.B.—Likewise for such as want health are the following provisions made, viz., advice in any distemper, *gratis*. Choice medicines very cheap. Elixir renovans, elixir febrifugum martis, 2s. 6d. per bottle. With several other sovereign medicines extremely cheap, which may be had of Moses Stringer, chymist and Mineral Master General, at his laboratory in Black Fryers."

(To be continued.)

THE Court of the Goldsmiths' Company have voted a special grant of £500 towards the effort now being made to increase the Endowment Fund of the Clock and Watchmakers' Asylum, New Southgate.

THE *Australasian* reports that a diamond has been found at Echunga diggings valued at £10.

VICTORIA exported during 1876 506,221 oz. of gold, representing a value of £2,025,957.

PRACTICAL INFORMATION FOR THE TRADE.

TO OXYDIZE GOLD, SILVER, OR BRASS.—Paint over the parts to be oxydized with a solution of chloride of platinum, then let it dry. To make the chloride of platinum in solution dissolve one drachm in two ounces of hot water.

AN alloy of 100 parts of aluminium and 5 of silver can be worked like pure aluminium, but is harder and susceptible of a beautiful polish. An alloy of 100 parts of silver and 5 of aluminium is nearly as hard as ordinary silver, but has the advantage over it of containing no metal of a poisonous nature or which can effect a discolouration of the silver.

HOW TO EXTRACT BROKEN SCREWS.—Place the watch-plate in a strong solution of common alum, which will in a very short time dissolve the broken screws and leave the plate uninjured.

SOLDERING SILVER.—The best solder for general purposes, to be employed in soldering silver, consists of 19 parts (by weight) of silver, 10 parts of brass, and 1 of copper, carefully melted together and well incorporated. To use this for fine work it should be reduced to powder by filing; the borax should be rubbed up on a slate, with water, to the consistency of a cream. This cream should then be applied with a fine brush to the surfaces intended to be joined, between which the powdered solder, or wire, is placed, and the whole supported on a block of charcoal to concentrate the heat. In the hands of a skilful workman the work can be done with such accuracy as to require no scraping or filing, it being only necessary to remove the borax when the soldering is complete by immersion in jewellers' pickle.

LECTURE ON A COMPREHENSIVE AND EASY METHOD OF EXAMINING GENEVA WATCHES WITH THE CYLINDER ESCAPEMENT. Delivered at the Horological Institute, on Wednesday, April 25th, by Mr. J. TRIPPLIN, Besangon watch manufacturer, F.S.E.D.; Mr. Jackson, V.P., in the chair.

TWO motives prompt me in giving this modest lecture; the first, that of serving a friend—a watchmaker with a sound practical knowledge and extensive scientific attainments—by putting in evidence some slight extracts of his masterly writings on watch-making, which, on account of my being a manufacturer of watches with cylinder escapements, came more directly under my comprehension; and the second, that of giving, as far as my limited but practical efforts will allow, a little more knowledge of the horizontal escapement than is generally possessed by English watchmakers.

Of this deficiency I speak knowingly, having had, up to the present time, to knock at many doors before finding a man really understanding properly its principles.

True, I found many who professed the most intimate knowledge with it, as we Geneva people assert that we know the lever escapement perfectly well; that, indeed, the complications of its angles, pallets, banking-pins, &c., are no mystery to us at all.

Well, perhaps in our schools we learn easily enough to make, on a large sheet of paper or on the blackboard, a correct drawing of it; but when the time comes to produce it on a much smaller scale, we somehow or other fail to do it properly, and hence the general belief in this country that the Swiss do not understand the lever escapement. I confess the general justice of the charge, although, of course, I claim exemption for some of us, the fact being that the cylinder escapement, although a plant of English growth, has now become more or less extinct in England, while its culture has been taken up by the French horological artists.

Now that, owing to the great competition in watch manufacturing and the extensive use of machinery, the price of foreign watches has been so reduced, their examination and repairing must be reduced in like proportions, and it is absolutely necessary that the workman who undertakes to examine or repair them should know exactly where to direct his attention, and how much of that attention the price which he receives will allow him to give to it; and it is therefore only by having a true and correct notion of the principles on which the accurate performance of that watch depends constantly before him, he can do it satisfactorily and to the best advantage.

I shall simply indicate to you the way to follow, and recollect that if the explanations I give you are too long, some of the operations I describe take actually less time to execute; but bear in mind that promptitude and surety in watchwork depends in a great measure on the method adopted—firstly, in the preliminary examination of the work; and secondly, in the details of its execution.

I shall speak more of those parts which are essential constituents of the cylinder watch, leaving out those which are identical in English and Geneva work.

I may state that my knowledge is drawn mostly from M. Saunier's works, entitled "Grand Traité d'Horlogerie Moderne," "Guide Manuel," and "Recueil de Procédés Pratiques."

I have in my watches used the processes described, and can, therefore, confidently speak as to their merits.

Please to recollect that although I am addressing the apprentices only, I shall, of course, be extremely grateful to those senior members present for any suggestions they may like to offer me.

I shall divide what I have to say in three parts:—

1. Preliminary Examination, including Motion Work and Examination of Barrel.
2. The Train.
3. The Escapement.

PART FIRST.

Suppose we have to examine a gentleman's watch, 18 crystal glass, and a gold lady's, 15 or 16, both with bar movements, these two specimens fairly representing those most sold in England.

By a general look over it all, see that the case joins well—that it does not show either blows received or too strong pressures—in a word, does not let in that element of destruction, slow but sure—dust.—See that the fly-spring acts nicely; ascertain, in the crystal-glass watch, that the head of minute-hand does not touch the glass, by trying the hand-shake of centre-wheel. Move the hands with the winder, see that they turn in a plane parallel with the dial. If the minute-hand inclines more on one side than on the other, it shows either that the wheel is out of upright or the centre-square bent. We shall have to remedy this by-and-bye when coming to the train.

The same remark applies to the fourth wheel and the second-hand it carries—do not forget the holes in dial. Open the glass; see that the hour-hand has sufficient play, does not touch either on dial, second, or minute hand; its shaking would denote a hole too large, or centre-square bent, or wings of canon-pinion of unequal height. Take the hands off: may I suggest this way, which, among others, I have always found most prompt and effectual? Cover the minute-hand with a piece of tissue paper, and pinch with the nippers, or introduce a bit of cardboard, slit in the centre, under both hands, stopped one over the other, and pinch as before said. Open your case, see that set-square does not pass the dome, so that a pressure exercised on the bottom of the case has no effect on it. The set-square should be a little smaller than the barrel-arbor.

Open the dome—make it open easily if necessary by cutting some of the undercut, round it, and waxing it afterwards. Ascertain that in the lady's it does not press on the index steel cover, this happening sometimes. With metal dome watches you mark the spot with a little rouge or oil, and turn a suitable hollow in the mandrel. See at the same time to stud-collet, it should be turned down and regit. In case of a gold dome, send it to a case-maker to have it raised, or do it yourself. Another stoppage is occasioned, although rarely, by the metal dome resting on the screws which hold the centre-cup. The screws must be lowered or a hollow turned, or the cup itself may stick in the hole of the dome; if so it must be freed.

Observe that the band or middle does not touch on the barrel, if it does the band must, in a silver watch be cut under if possible; in a gold one this has to be remedied differently—viz., by lowering the barrel. See that the head of fly-spring does not touch on the banking pin on rim of balance, especially in lady's watch. Correct this by filing it, if you can do it safely, or by filing the spring or lowering the balance by bending its arms.

Take dial off: in an enamel one with two screws, see first that they act, feel the dial and ascertain that it rests properly flat all round; if not, then it touches either on the barrel-arbor, stopwork, minute motion-wheel stud, end stones, or some end screws too long. If the barrel-arbor and the pin maintaining the stop-finger allows it, it must be lowered and repolished. If it is the stop-finger, and it is higher than the star-wheel, than the dial must be reduced in thickness by turning off some of the enamel by means of the emery-wheel or emery file. If the end stone, if possible it must be stoned down; if not, use the emery-wheel. Use your discretion about the minute

motion-wheel stud, and if screw ends too long reduce their length. All these faults happening in a lady's watch with silver-gilt or gold dial can easily be remedied by raising gently the dial. This being seen to we pass on.

See that the depth of motion work is correct, that they play freely, if hour-wheel has too much shake on cannon pinion than it must be changed.

See that it is not foul of barrel or star-wheel. This fault shows a want of proportion in the respective sizes of hour and star-wheel—correct it this way: if star-wheel is too thick, by reducing its thickness until it can be safely passed over, or bevelling star-wheel or raising the barrel where possible. Sometimes you have to bevel hour-wheel, but the proper way would be to replant the motion-work in a smaller centre. You may now ascertain that the barrel has sufficient space to turn freely in the plate, if not, having secured the proper depth with centre wheel, turn it in the mandrel, centring from barrel-arbor hole. Take movement out, see that barrel has proper play between centre-wheel, plate, click-spring and barrel-bar, and having noticed this and also its depth with centre-wheel, and that there is no burr under it, take it off and take it to pieces, leaving only the bar with the click, barrel-arbor, and barrel-arbor cover. See that barrel-arbor turns properly, neither too stiff nor too loose. If it shakes you will have to cut on an arbor part of the barrel-arbor cover on the edge, or better still do it with the mandrel leaving only the centre part to press on the arbor. If too stiff, and here is one of those faults by which you can correct several others, viz., stopwork touching on dial, star-wheel rubbing against hour-wheel, barrel not having sufficient play between centre-wheel, or being too near the plate or band. According therefore to circumstances you either lower or raise your barrel by turning out in the mandrel some portion of the bar, or turning a similar space on the inside of the barrel-arbor cover or axis.

Now, I suppose the barrel-arbor turning properly, ascertain that the click acts well, that it goes to the bottom of the ratchet tooth, see that all of them are clear from that thick oily stuff remaining sometimes between from the rough factory work. It is very important that this should be seen to properly. You correct it partly by filing off the side of the bar until the head of the click is low enough, then you try to bring it back by bending the steady pin a little, but this seldom succeeds. If you wish a correct job you had better replace the side spring, but this fault is never found in a good watch. You reduce, if necessary, the strength of the click-spring by diminishing its thickness. You should ascertain that it is properly hardened and tempered by just touching it with the file, if not it should be made so. If it cannot be hardened, then it must be replaced, as the click, no more than the barrel-arbor, or, indeed, any other part of the watch which should be of hardened steel instead of soft iron, can last without this latter condition being observed.

You have noticed previously to this what play there is between the barrel, bar, and side-spring. Any want of play is easily remedied with the mandrel or the file, but recollect that whatever tool you use you must use cleanly, and take off all coarse traces of your work either in filings or burrs.

I need not make any allusions to screws which over-turn, they must be replaced whenever found. Now put the barrel on its arbor, see that the hole is not too large, you correct this error by stopping them, or using the closing tool. Screw on centre-piece, the size of which should not exceed a third of the diameter of inside of barrel, and see that barrel turns free. If too much shake, then chamfer the hole in the centre-piece, if not enough turn a small hollow on barrel or diminish the shoulder inside.

Now place cover on, and see that barrel turns freely and flat; if out of flat, try first the putting the cover in different places, and make new marks. If that does not succeed, file a little off the side of cover on that side of the barrel which is the uppermost, holding the barrel-arbor square with the sliding-tongs. Should you make the cover too free, then you have to hammer it slightly on the opposite or the lowest side. Do this with care and attention, as nothing—in the estimation of a conscientious watchmaker—is more sad than the sight of burrs, filing, hammering, and other negligences, which are revealed on examination of parts, the outside appearance of which led you to expect something better. It should be done thus: place a piece of tissue paper on the anvil, then, resting the side of your cover very flat on it, you hammer gently on the edge, you will, by these means, obtain the desired result, showing scarcely any traces.

Now we come to the stopwork. The combined diameter of star-piece, plus stopwork, and finger, ought not to exceed half that of the cover, leaving free on each side a half of the diameter of the star-wheel. The star-wheel and stop-finger should be of equal size. The soundness of this principle having been demonstrated, place star-wheel so that it turns freely on its shoulder, observing

that the head of the screw fits the hollow, and comes on a level with it. See that its teeth are cleanly and frankly cut. Put finger on and see to depth; the finger should almost reach the bottom of the slot, and the crescent of the star-wheel ought to coincide with the circumference of the finger. When the stop takes place, the finger ought to rest securely on the shoulder in the line of centre, as seen in fig 1 A.

Make it turn one way, and then the other. With a piece of peg-wood, incline the star-wheel at the moment of its being passed by the finger in the direction contrary to that it ought to take, and, consequently, to the most unfavourable to its safe functions. (See fig. 1 B.) If this takes place in a satisfactory manner you may let it pass; but if there is too much play, change at once the defective piece. Attention ought to be paid to their running smoothly together, the slightest inequality or roughness being sufficient to occasion a stoppage; you should, therefore, take them away, and turn an emery buff over the edge.

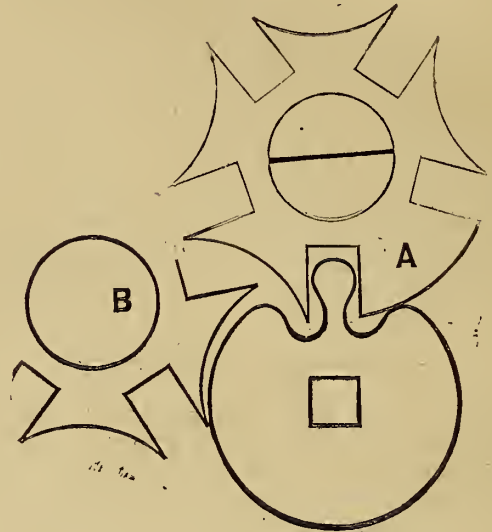


Fig. 1.

Now take them off, as well as cover, and put main-spring in, turn with winder, and see that it does not rub either against barrel or cover owing to hooks not properly placed or want of room; if this last fault occur, see spring is not too high—i.e., does not exceed the height of the groove, then the cover must be turned thinner in the mandrel, which may conveniently be done by reversing it on barrel. The spring should take at least four and a half to five turns, and occupy a third of the inside of barrel.

I think I have now summarized the examination of the barrel, and you have only to put it cleanly together. A fault which is frequently committed—viz. that of scratching the gilding off the barrel, may be easily avoided by using a small piece of paper between barrel and bar, and tearing it away when the spring is put in.

THE TRAIN.

Now we come to the train.

Take off cock and balance, after having previously observed its position with regard to centre-wheel, fourth-wheel, pinion, scape-wheel, bar, turn button, collet stud, banking pin, &c.

With a little oscillatory motion given to centre-wheel, you can ascertain at once any of the following faults:—

1. Too much play in holes, or not enough.
2. Not sufficient play between centre-wheel, its bar, and bar of third-wheel. Centre-wheel should come on a level with third-wheel pinion.
3. Wheels out of flat.
4. Wheels out of truth.
5. Pivots too long or too short. They should come on a level with bottom of oil sinks.
6. Wheels not having sufficient play in their sink, touching either side or bottom.
7. Escape-wheel teeth, touching in passage. Ascertain this fault by turning the movement over. The best way is to try the escape-wheel by itself.

8. The state of set square, cannon-pinion and second pivot.

9. Insufficient end shake.

10. Lastly, and most important, the depths, and the state of shape of teeth and leaves of pinion.

Let us dispose at once of fault No. 1.

If too much shake in centre-holes, they must either be stopped or made smaller. Third and fourth wheel holes ditto, if in brass. Care must be taken that they are perfectly upright. Do not forget oil-sinks, including centre-wheel holes. If jewels they must be replaced, supposing before the size of the pivots to be good.

Faults Nos. 2, 3, 5, 6, and 7 are easily remedied by mandrel, file, and turn. In enlarging fourth wheel sink you must take care not to break third bottom hole.

4. Supposing wheels of the right size and proportions, you recut them after having seen that the shoulders turn true. This is important, because recutting the wheel in that state is simply perpetuating the fault, nay, making it worse.

8. Set square; should run smooth, and still hold rather firmly. If too free it must be replaced. Pivots of centre-wheel should project a little above bar and below plate. Cannon-pinion ought to be nicely polished, &c. See that second pivot is not bent.

9. There are several ways of making end shake. The proper one, supposing the bars to rest squarely on the plate, is, especially in jewelled pieces, to turn back the pivot-shoulder. But if you find fourth-wheel bar with nose bent to the centre, and all your other bars in a plane perfectly parallel with the plate, you may, in order to re-establish the perpendicular of your hole, redress it this way. Put a piece of paper on anvil, place on it the side of your bar, then hammer gently on the sides. The result will scarcely be seen. If too much shake, you reduce it by filing uniformly under the bars, so lowering them.

10. Now we come to depths.

We shall at once resolve all difficulties on this subject by seeing the conditions in which good depths are made.

Let me remind you of a principle. If you make a circle supposed to be provided on a point of its circumference with a penail, travel along the circumference of another circle, the curve described is called an epicycloide.

In ordinary depths of watch-work the curve of the tooth of the wheels must be made in an epicycloide, traced by a circle, half the diameter of the pinion running on the primitive diameter of the wheel.

The curve of the pinion leaves should be made also according to an epicycloide described by a circle half that of the wheel; but in practice it has been found easier to make it in half a circle, and the sides of the leaves must be in a plane going straight to the centre. So much for the shape of teeth of wheel and leaves of pinion. Now as we have not to alter the positions occupied by our wheels and pinions, we shall not follow M. Saunier into his exposition of the theory of the respective sizes of either of them—especially as this would take too much time—but shall simply consider them as far as their relative proportions are concerned.

Pinion six leaves should have one-third leaf and two-thirds space. The teeth should have as much of leaf as of space.

The contact should commence at not more than half the thickness of a leaf before the line of centres, when the contact of tooth and pinion leaf passed the line of centres, should be about ceasing, or almost at an end.

With pinion of seven leaves, the contact begins when two-thirds of leaf has passed the line of centres.

With pinion of eight, when about three-fourths has passed.

With pinion of ten, on the line of centres, teeth still being proportioned.

But practically, under all conditions, a little shake is always to be found.

If being proved that there is a necessity for driving the pinion as near as possible the line of centres, you will know on what you are to base your examination of depths; and should you find a pinion a little smaller than it ought to be, it should rather be preferred to one a little too large, as it allows of contact nearer the line of centres, whereas a larger one causes contact too soon, thereby introducing errors.

The most correct way to try the size of a pinion relative to the size of its wheel is the sector, as every degree is divided, and you may see yourself how far the pinion is faulty.

But a shorter and easier way is done with the pinion gauge or compass.

I give it; but whenever you have the least doubt, the depth should be tried on the depth tool, and you should never hesitate about changing a pinion whenever found defective, as it is an endless source of stoppages.

The opening of the pinion gauge must, in order to give approximately the size of pinion, measure on the outside—say,

A pinion of ten, four full teeth.

A pinion of eight, four teeth on the point, less one quarter.

A pinion of seven, a little less than three full teeth.

A pinion of six, three teeth on the points.

In finishing this very short description of a subject on which hours of explanation might be devoted, let me impress upon you the care which you ought to bestow on the fourth wheel depth. Let fourth wheel and escape-wheel be placed together, after having ascertained carefully their separate freedom, state of pivots, jewel-holes, &c.; put a piece of peg-wood on pivot of escape-wheel, so as to restrain its liberty; then drive fourth wheel with another piece and feel carefully. If they do not turn smoothly together, in spite of a proper shake, you may be certain that there is something wrong in the size of escape-pinion.

A frequent cause of stoppage is found in the absence of bottom shoulder in the escape-wheel; it causes the oil to spread over the pinion, where its presence accelerates the destruction of the parts in contact, and renders the friction of the depth unequal and variable; and so it is seen often marked or cut in comparatively new watches.

The size of fourth wheel determines that of escape-wheel, which should have sufficient freedom between fourth wheel pinion and third wheel teeth. This fault happening sometimes, I must indicate some of the ways to obviate it. See first that your wheels stand upright, then look to your fourth pinion. Here you will generally find the fault, it being often too high; it must be lowered, and the face re-polished. If third wheel wants lowering in consequence, then do it by bending the arms, and see that there is sufficient play between it and plate. Do not forget that it is always desirable to operate on the part that shows less traces of your work.

If escape-wheel touch on third wheel the third wheel must be moved either by topping it when the depth will allow, or re-planted; this is easily done in a watch with brass holes. If jewelled, the bottom hole must be stopped and re-jewelled. You centre top hole by moving the bar by means of steady pins.

It is needless to tell you that, in case of any deformity either in wheel, teeth, or pinions, the only and prompt remedy is to change the defective piece, unless the deformity should not be such as to exceed the correcting power of the "Ingold cutter," which we use extensively in our factories in order to obtain—firstly, the proper epicycloidal shape of the curve of the teeth and an equalization of their thickness. We generally succeed by its use to make our depths run pretty smoothly.

NO. 2.—THE ESCAPEMENT.

Having the train and escapement in their places, see that balance is free, that its pivots, coming sufficiently through their holes, rest securely on end stones.

You notice on the plate near the edge of balance three small marks or dots; they show the lifting of the escapement and are the third of the diameter of the balance, which is, or should be, about the size of barrel less teeth, or twice the diameter of escape-wheel. See that point on rim of balance is opposite the central dot on the plate. The escapement then ought to be at rest. Make that sure this way: Press on centre wheel with left index finger, and with a piece of peg-wood controlling the movements of the balance; see that the lift takes place with point on balance at equal distance from central dot on the plate; when that is not so, it must be corrected, and a new mark made on balance or by moving the hair-spring collet, it being important that you should know how to fix it so as to obtain the right beat.

Now look carefully to the position of escape-wheel in the cylinder. The larger opening ought to admit the total height or thickness of escape-wheel, plus one-half allowed as surety top and bottom.

The small slot should be on an average three times the height of bottom of escape-wheel, and should cut the cylinder so as to leave only a quarter of its whole circumference. The maximum of the thickness of its shell ought never to be more than one-eighth of the total height of curve of escape-wheel; in fact, the thinner the better, and it must turn perfectly true.

See that escape-wheel and cylinder stand quite upright, and should you find the escape-wheel too high, a position which would occasion a slight recoil, raise the balance by bringing end stone nearer the jewel by stoning it, or by turning off on the mandril any excess of material which may be between it and the surface of end stone—but recollect a little space should be left as a reservoir for oil—or by turning bottom bar sinks in mandril, or, lastly, by filing

bottom bar when little is required. Then see to end shake by bending balance bar slightly upwards, if necessary.

To lower the balance is more difficult, and I suggest at once to have recourse to the escape-wheel by raising or lowering its arms on a small brass or lead plot and striking on its arms near the centre with a brass punch.

Having now seen that their relative position is safe, we proceed to ascertain lifting or impulse angle.

Mr. Henry Robert, once talking to me in my days of apprenticeship in trying to make me understand the working of the cylinder escapement, compared the action of the escape-wheel tooth to that of a wedge used by a wood cleaver.

may be readily set out with a protractor. Divide the first space into degrees, or (as we shall only require those divisions showing the points of contact of the cylinder with teeth of wheel) mark off carefully the degrees from 10 to 15 from the radius $A B$. Take between the points of compasses three and a half of these five degrees, and mark that distance inside the circle B ; from this mark, taking A as centre, draw the circle D . Take distance from B to the junction of the circle D with radius $11 B^A$; this distance is correct for the length of escape-wheel tooth. From the point B mark off a line ($B F$), making an angle of from 13 to 15 degrees with the radius B^A . This forms the heel of the tooth.

Take as distance three-fourths of radius $A B$, and, with B and B^A as

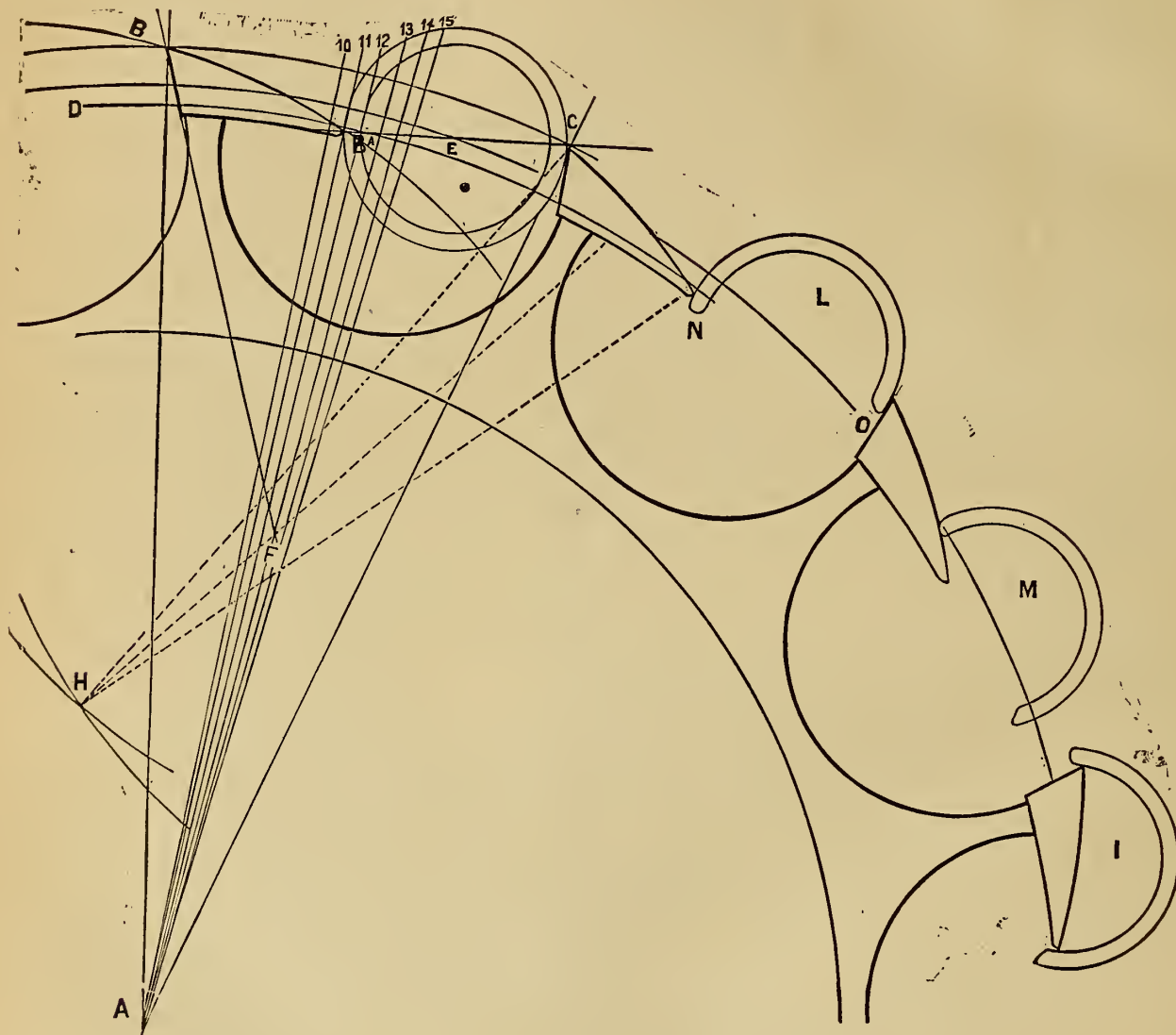


FIG. 2.

The block of wood is the cylinder, whose arc is to be displaced, and the wedge represents singularly well the escape-wheel tooth.

But in order that my explanations respecting it might be better understood, let us draw an escape-wheel.

TO DRAW THE CYLINDER ESCAPE-WHEEL.

On thick drawing paper, properly fixed, take as centre A , fig. 2. From this point describe a circle, or part of one, the size of which is quite immaterial.

Now draw $A B$, a perpendicular line, from A , the centre of circle, to a point of its circumference. The line $A B$ is called the radius of the circle. From the point B divide the circle into 15 spaces. The circle being 360 degrees, each space will occupy 24 degrees. These

centres, draw curves, the junction of which (as seen in H for second tooth) will give the point from which to draw the impulse curve of the tooth.

Now describe within the circle D , at a distance of one-half from it, one of the degrees already marked off as a supplementary circle to form the inside of tooth. Round off the point of the tooth as shown, in order to diminish friction, and reduce it to a minimum.

These directions having been followed, the result will be a tooth shaped correctly according to all recognized principles.

Next draw the semi-circles, showing the spaces between the teeth, the depth of which should not be less than one and a half the diameter of cylinder. You have now only to repeat these given dimensions to other radiuses, and then to draw the inside rim of your wheel to complete it.

THE CYLINDER.

From B^a to c draw a line, the middle of which, as seen in E, should be the position of the circle representing the line of centres, and shows the proper depth of cylinder and escape-wheel.

Taking E as centre, then draw a circumference touching B^a and c, and an inner one touching radius 12, that will form the thickness of cylinder.

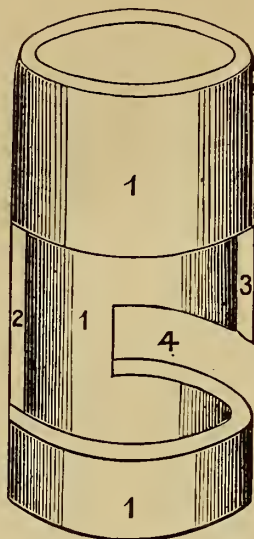


Fig. 3.

1. The shell or circumference of a cylinder.
2. Entering lip } Great opening.
3. Exit lip }
4. Small opening or slot.

If your divisions from 10 to 15 have been correctly made at first you will find that your escape-wheel tooth will go in without play, as seen in I, thus showing "inside drop" and the cylinder between two teeth, as seen in L, showing "outside drop"; in M the cylinder is at rest.

A good cylinder should have, when finished, a little less than seven-twelfths or three-fifths of its full diameter. The entering lip being rounded, as seen in N, and the exit one, as in O, and both should be carefully polished.

To test easily and rapidly the correctness of this opening—which you recollect is very important—we use what is called the Jacot

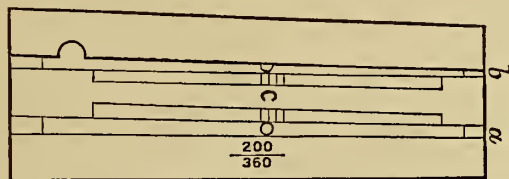


Fig. 4.—Jacot Gauge for Cylinders.

gauge. It is formed of three steel bands, bound at their extremities, and having between them two longitudinal slits A and B (see fig. 3). The proportion of the width is the same along the whole length; namely, the width of the great slit A representing the full diameter of a cylinder (see C), and the corresponding number of the small slit will show its opening.

For example, look at C, where in the slit A the cylinder is stopped; it should stop at the same spot in slit C, were the opening to C correct. But, besides this way, M. Saunier gives several others.

You might, when having once made your drawing, cut off the outside shape of escape-wheel and apply it against a black board or surface, and allow it to move on its axis.

Do the same with cylinder, or the circular piece of paper representing it, blacking the parts which do not represent its outer shell, then fixing it by a pin on the line of centres, you may observe yourself its working in different positions, after having secured a little play by cutting off extremity of escape-wheel.

Now let us see to the lifting of escape-wheel. When it takes

place the dot on balance should come just opposite to left and right caliber dots on plate; if too deep or too shallow it must be corrected. See that sink of bottom bar, hole in the plate, and screw sink are not likely to impede its being moved; then with an elongated chamfer enlarge steady pin-holes and bend these. Do this until the dot on the balance corresponds with caliber dots, the correctness of which you had better ascertain if in doubt.

This done, put barrel on and wind a turn or so. Control movements of balance with left index finger: turn it to the left until a tooth falls to rest, then take it a little to the right, so that the cylinder is quite between two teeth, then by means of a little oscillatory motion given to escape-wheel, feel the play—there ought to be scarcely any; then turn balance to the right, back a little when tooth has dropped, and feel again. *The play should be equal inside or out.*

But if insufficient inside and outside it shows the cylinder is too thick, or the teeth are too long. If too much inside and not enough outside, the diameter of cylinder is too large.

If too much outside and not enough inside, cases the cylinder is too small.

In the two latter cases the cylinder ought to be replaced.

If there was too much of inside drop and showing thus none outside, with a cylinder a little thick, teeth too short and cylinder too big—two faults at the same time; the whole of the escapement would have to be re-made.

When the diameter of cylinder is a little too large, but thin, or when it is simply too thick, if outside drop is good, although inside is too great, good timing results may be expected.

When there is but little outside drop, although with a little too much inside, the cylinder opening well proportioned, a good incline plane to the teeth, good vibrations are obtained, and the watch times well.

You will by this see what you will have to replace, and what you may have to correct.

Ascertain all this carefully by trying the lifting of the fifteen teeth one after another, and marking with a little rouge those that will want shortening. File the extremity lightly on a receding angle, so as to keep the point of friction as small as possible, although not sharp, and polish carefully afterwards. See at the same time that incline plain is perfect. The sharp angle of the heel should be just a little rounded, but ought never to be filed, except in the very rare case of its being too square, and touching by its inner angle to cylinder. I may mention here that the stoned surfaces of teeth are preferred to the polished ones on account of their keeping the oil better.

If you are in the necessity of making use of a wheel with some teeth irregularly too long, it would be better to give the necessary play to the longest only, rather than make them all too short.

The consequences of too much drop are a great loss of power, a more quick wearing out of cylinder (especially when soft), of a greater difficulty to time, &c.

When the cylinder is not open enough, the rests, being greater, have, by the thickening of the oil, greater influence also; besides, it requires an escape-wheel tooth more inclined and a greater motive power, two destructive agents. When too open, the watch does not time well, as no good vibrations can be obtained.

Sometimes the slot is open in an eagle-tail shape behind; this occasioning recoil in some positions, it should be altered with ruby file.

ESCAPEMENT.—BANKING.

To ascertain the banking, engage a tooth in cylinder; then turn balance to the left until it banks or where it should bank, and feel escape-wheel; *it ought to have a little shake*. Reverse the movement, then again feel; *the same shake should exist*. If not, then the banking pins are not exactly opposite each other when escapement is at rest. Rectify this by changing balance-pin. This you will find generally sufficient; but if the effect is not obtained, then reduce the thickness of banking pins. Then, if in spite of all this you were not to feel this shake, it would show a cylinder not cut to a quarter of its thickness, or an escape-wheel with arms too large. Sometimes the banking is due to too great vibrations of the balance, owing to too great motive power. Mainspring must be changed, and, if necessary, the lifting a little reduced; *but this fault shows a balance too light*.

ESCAPEMENT.—TIMING

We have seen that our balance was perfectly free. Just looking over the state of jewel holes, I ought here to remind you that they should be made of ruby or sapphire, and of nothing inferior, that

the holes are well polished, quite perpendicular, of a length of about $1\frac{1}{2}$ times the diameter of pivot, and well sunk.

The pivots of balance in 18, 16, and 15, measure generally from 12 to 10 at the gage, and proportionately long. Their shake should be about five degrees; pivots of escape-wheel not quite so much, but balance should be kept a little freer, because if a little too tight at first, it will keep free well enough while the oil is fresh; but as soon as it gets thick the vibrations will diminish, the watch rate will vary, and finally it will stop.

A light balance does not time well; it is too much influenced by motive power, resistance of the air, thickness of the oil, &c. Too heavy a one neither, it increases the frictions, and the chances of breaking of pivots through a fall, wants stronger motive power and hair spring, and in some cases renders the timing more difficult, especially from horizontal to vertical position.

However, let us try to time one in this position, supposing this difficulty to exist.

TIMING IN POSITION.

Discrepancies between horizontal and vertical positions proceed from the difference of frictions in the two positions caused generally, supposing the balance perfectly poised, &c., by the inequality in the size of pivots, in their length, the size of holes, their thickness, the thickness of their sinks, &c. In most cases it is sufficient to give to the holes a thickness equal to diameter of pivot, and see that its extremity is perfectly rounded; some say flat. If this has not the desired effect, do this: The watch being timed flat, hang it up; if it gains take off a little matter at the bottom of balance. The top of balance being thus made a little heavier than the bottom, the arcs of vibration will then be made a little larger and slower in the vertical position, without having varied sensibly in the horizontal. If, on the contrary, it loses, then lighten the top of the balance. Then the bottom being a little heavier, the arcs of vibration will be smaller, and will correct the gain in the vertical position. These means are used but in ordinary watches, and more for jobbing purposes, as they offer very little certainty about the watch occupying constantly the same position.

HAIR-SPRING.

Although there is much to be said about the hair-spring, I shall simply mention it more as a reminder than with the intention to tell you anything new. It ought to have, say, from eight to twelve turns. It must be perfectly flat, parallel with the arms of balance and cog, with which it must have sufficient safety. Its first turn must not strike against stud centre-wheel or waste end of spiral. It must be shaped according to the curve described by the turn-button, otherwise this one would lose the effect for which it is intended. The first turn must play freely between pin and turn-button without, however, allowing the second turn to touch it. All the turns should open and shut together at the same time, because the regular working of a hair-spring is the best indication of its timing faculties. In modern watches the rule is that the hair-spring should have a diameter equal to the radius of the balance. Accordingly we take with the compass the half of that radius, and centering from balance-hole, mark the place of stud and of pin.

Now that our watch has been examined, we have only to put it together as rapidly and as cleanly as possible. Beginning with centre-wheel and its set-square, then fourth and escapement wheel, do not forget oil to every hole and every tooth of escape wheel, put a little, but not too much; then balance, and finish with barrel.

A word about our gilding. Although reproaches are constantly addressed to it on account of its lightness, I have never known it to fail when used with a perfectly clean brush, however hard it may have been. When obliged to immerse pieces either in essence Lemoine or spirits of wine, we dry them up with a piece of clean cloth, and find it quite effectual in keeping its brightness.

After such cleaning, always pass a piece of peg-wood through the holes.

Now I bring my lecture to a close, and in doing so I must again appeal to your indulgence for its numerous shortcomings. But hours might easily be devoted to some of the subjects I have scarcely been able to touch upon. My object has been to put before you the experience which I have acquired as a watch manufacturer and examiner of watches with cylinder escapement, and in order to enable you to do so with certainty and rapidity, I have reminded you of some of the principles which direct us at Besancon and Switzerland. I have made purposely allusions to a great many faults which are scarcely to be met with in a single watch; but if watches were made perfect they would not want examining, and there should be of course no necessity for examiners or for this lecture. But I

may safely assert that out of about 2,000,000 watches annually produced by France, Switzerland, England, and America, there are not 20,000, or 1 in a 100, that do not require examining before being put in the hands of the wearer.

At the conclusion of the lecture, Mr. Peake adverted to the importance of avoiding excessive height in the opening of the cylinder of horizontal escapements, so that the teeth of escape-wheel should be kept in contact with the oil, and said that he had found that the troublesome fault of the pin striking the bankings was not always effectually remedied by changing the main-spring.

Mr. TRIPPLIN said that in such cases a heavier balance must be applied.

Mr. STOCKALL, speaking from a large experience as an examiner of horizontal watches, said Mr. Tripplin's admirable and thoroughly practical remarks would be of great assistance to, and be gladly welcomed by, thousands of country watchmakers.

On the motion of the Chairman a vote of thanks was enthusiastically accorded to Mr. Tripplin.—*Horological Journal*.

A TIME BALL IN NEW YORK CITY.—An arrangement has been concluded between the Superintendent of the United States Naval Observatory at Washington and the Western Union Telegraph Company, for the purpose of transmitting the standard time, as determined daily by the Naval Observatory, to shipowners and masters, business men in general, railways, chronometer makers, and others, and to the public generally. In pursuance of this agreement, a time ball of large size is to be dropped daily from the tower of the Western Union Telegraph Company's main building at New York city, and arrangements will be made for controlling public clocks in New York and other places, and also for transmitting the noon signal of the United States Naval Observatory to various cities in the United States having more than 20,000 inhabitants. In New York, at 11.55m., a time ball will be hoisted half-way up the iron flagstaff on the tower of the Western Union building, at the corner of Broadway and Dey Street. This ball is 3 feet 6 inches in diameter, and can be seen by all the shipping lying at the New York and Brooklyn docks, and on the New Jersey shore, as well as by all vessels lying in the bay, even beyond quarantine. For long distances an ordinary ship's glass will be needed. It can also be seen in Broadway from Tenth Street nearly to the Battery, and from many positions it can be seen by a large majority of the citizens of New York, Brooklyn, Hoboken, Jersey City, &c. The ball will remain at half-mast from 11h. 55m. to 11h. 58m. At 11h. 58m. it will be hoisted to its highest point, about half-way up the main-staff—that is, over 250 feet above the street. It will be dropped by an electric signal at exactly noon by New York time. The longitude of New York being assumed to be that determined by the United States Coast Survey for the City Hall. 12h. 0m. 0.00s. New York time = 11h. 47m. 49.53s. Washington time; 12h. 0m. 0.00s. New York time = 4h. 56m. 1.65s. Greenwich time. If, on account of high winds, &c., the ball fails to fall at 12h. 0m. 0s., it will be kept at the mast-head till 12h. 5m. and then dropped at 12h. 5m. 0s. In such cases, a small red flag will be hoisted at 12h. 1m. and kept flying till 12h. 10m. The time of falling of the ball will record itself automatically, by electricity, near the standard clock of the Western Union Company (which is regulated by signals from the Washington Observatory), and if by any cause it does not fall precisely at noon, its error will be known. In the evening papers of the day, and in those papers of the following morning, a notice will be inserted, stating whether the ball fell at the correct time, and if not, its error fast or slow. In this way, even signals which high winds or other causes have prevented from being given precisely will still be available for the regulation of clocks and chronometers. This ball will therefore serve to regulate the clocks of New York City to standard New York time, and will also serve to correct chronometers of ships lying in the harbour.—*Scientific American*.

PRICES CURRENT FOR GOLD AND SILVER.—VALUE GIVEN FOR OLD GOLD AND SILVER BY ASSAY. Fine Gold, 84s. per oz. Fine Silver, 4s. 8d. per oz.

PRICES CHARGED FOR GOLD AND SILVER.—Fine Gold, 85s. 3 d. per oz. Fine Silver, 5s. 3d. per oz. Standard Silver, 4s. 8d. to 4s. 10d. (variable.)

CORRESPONDENCE.

It must be distinctly understood that we do not necessarily identify ourselves with the opinions or views of any of our Correspondents. Our pages are alike open to all for free discussion of questions connected with the various trades which we represent, and all Correspondents will find every opportunity afforded them for expressing their opinions.

SILVER DUTIES.

To the Editor of THE WATCHMAKER, JEWELLER, AND SILVERSMITH.

SIR,—May I be permitted to make a few remarks in reply to "A manufacturer of 35 years' experience," whose letter appears in your last issue.

In the first place, he "contends that taxes are necessary." This is a simple statement of fact, admitting of very little contention; so far the Court is quite with "A Manufacturer." The proposition is about as self-evident as that, in order to live, it is necessary to breathe.

But (2) he contends "that the tax on silver goods, being upon articles of luxury, and not of necessity, is a just and proper tax."

I would venture to remind "A Manufacturer" that the question of taxation of articles of luxury has been well debated in the House of Commons, with this happy result—that all taxation upon industry, of course including many departments of trades in articles of luxury, has been swept for ever away, with the one and the only one exception, viz., the tax upon silver plate.

Of course, it is quite competent to "A Manufacturer" to entertain an honest opinion that articles of luxury should be taxed. There are, doubtless, some Members to be found in the House of Commons to agree with him; but it is nevertheless a fact that when the Chancellor of the Exchequer makes his annual statement, no one is found to advance arguments in favour of a tax upon articles of luxury.

One thing is absolutely certain, viz. that the House of Commons would not listen, for one moment, to such a proposal.

I am afraid that the financial policy of the country during the last 35 years is a complete blank to "A Manufacturer." He, unhappily, is unaware that, during that period, the whole principle of taxation has been altered. The tendency of modern legislation is towards concentration of duties upon the great articles of every-day consumption—viz., tobacco, spirits, wine, beer, tea, coffee and chicory: no other; the tax upon silver plate remains as a practical argument for its own abolition; it is an article of luxury; it is *not* an article of consumption!

How far this has been a successful policy is now an ascertained fact, admitting of no contradiction whatever. It is no longer a theory. The Excise and Customs duties prove most conclusively that the policy of free trade, almost universal as it has now become, in this country, is the secret of the nation's prosperity. As trades have been relieved from taxation, so the members of those trades have prospered: as they prosper, so they contribute more and more largely to the duties upon articles of every day consumption, and to the Income Tax, which, as we all know, now produces £1,700,000 to the penny as against £800,000 of a few years ago.

But, to return to the arguments contained in your correspondent's letter:—

(3.) "That the duty is a guarantee of quality, without which the silver trade would become a swindle." This is a proposition almost too absurd! The duty a guarantee? How? "A Manufacturer" of 35 years' experience not even able to distinguish between a duty and a hall mark! A hall mark may or may not be a guarantee, but most assuredly the duty is no sort of guarantee. But, I must not trespass any further upon your valuable space. The remaining arguments of "A Manufacturer" are arguments positively in my favour. I accept them with gladness, as distinctly predicting the success of my so-called "agitation." Your correspondent finishes his letter with the following sentence—"Perhaps there is another kind of free trade that I do not know." I am afraid that there are several things which your correspondent does not know,

I have the honour to be, Sir,

Yours faithfully,

Pall Mall East, May, 1877. EDWARD J. WATHERSTON.

DEAR SIR,—

"QUEEN ANNE'S FARTHING."

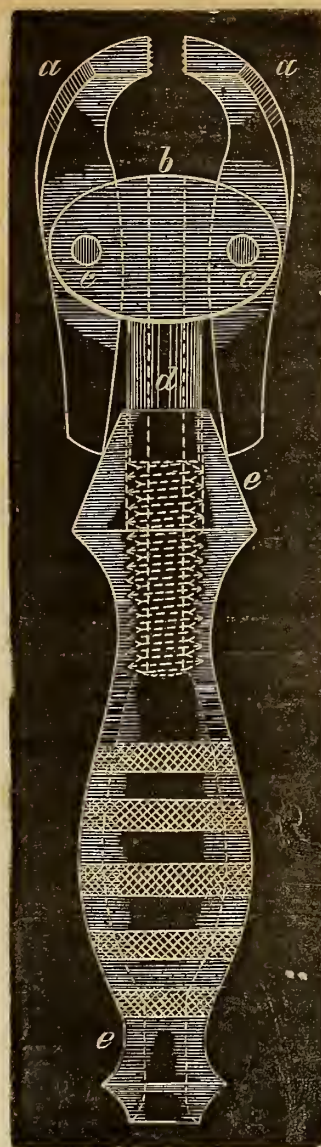
I have in my possession a Queen Anne's Farthing, the property of Colonel North, M.P., which bears the inscription "Anna Dei Gratia." I think that "Anna Dei Gloria" will be found to be incorrect.

Faithfully yours,

Pall Mall East.

EDWARD J. WATHERSTON.

PATENT HAND-VICE.



THE accompanying illustration represents a hand-vice invented in America, and manufactured on a large scale by T. G. Weisser & Sons, tool manufacturers, St. Georgen (Baden.) The great utility of this tool to watchmakers and jewellers will be perceived at a glance. The jaws *a a*, which are made of hardened cast-steel, are let into slots in the oval piece *d*, and fastened by pins *c c*. The part *c* ends with a screw on which the handle *e e* can be wound and unwound. The upper part of the handle being of a conical shape, the jaws *a a* are closed by turning the handle to the right and part by turning it to the left. Two small spiral springs, fixed on each jaw in the part *d* force the latter open as the handle recedes. No workshop should be without this valuable assistant.

THE Worshipful Goldsmiths' Company have awarded to Mr. Herman Bush, of Hull, the sum of £30 towards defraying the expenses of publishing his catalogue of English and foreign practical and scientific works relating to the precious metal trades.

PRIZE OFFERED FOR BEST BLOWPIPE APPARATUS.

A PRIZE of £10, which has been placed at the disposition of the council by Col. A. A. Croll, is offered by the Society of Arts, with the Society's Silver Medal, for the best set of blowpipe apparatus which shall be sold retail for one guinea. The apparatus must, at least, contain blowpipe, blowpipe lamp or candle, spirit lamp, charcoal or charcoal pastilles and holder, platinum wire, glass tubes closed at one end (matrasses), open glass tubes, platinum-tipped forceps, magnet, hammer and anvil, and four re-agents, viz., borax, microcosmic salt, carbonate of soda, and nitrate of cobalt. These instruments and re-agents, together with any others which may be thought desirable, must be packed in a box. It must be understood that the above list of apparatus, &c., is only intended to include such as are absolutely indispensable, and it is expected that the set will contain additional instruments and re-agents, the selection of which is left to the competitors.

Special attention should be paid to the following points:—
1. Solidity of construction. 2. Compactness and portability.
3. Facilities for packing and unpacking. 4. Number of useful instruments and re-agents in addition to those mentioned.

The society does not engage to give the prize unless some apparatus appears to show sufficient merit, and some advance on what is now obtainable for a guinea. All apparatus for competition must be sent to Society's House on or before 1st August, 1877. The successful competitor must guarantee that a proper supply of the apparatuses shall always be kept on hand for sale in England.

THE Watchmaker, Jeweller, and Silversmith,

A MONTHLY TRADE JOURNAL,

Devoted to the interests of Watchmakers, Jewellers, Silversmiths, Opticians, and kindred Trades; published at MILNERS' BUILDINGS, MOORGATE STREET (OPPOSITE MOORGATE STREET STATION), LONDON, E.C. Booksellers and Newsagents supplied by Messrs. Catty & Co., 12, Ave Maria Lane, Paternoster Row, E.C.

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Cheques and Post-office Orders to be made payable to A. VICTOR, at Lombard Street Post Office.

SPECIAL NOTICE

CLOSE OF THE SECOND VOLUME.

THE SECOND VOLUME OF THIS JOURNAL ends with the present number. We have comprised thirteen instead of twelve numbers therein, in order that the ensuing Volumes shall commence every July with the even half-year. Thanking our patrons and the Trade generally for the support we have received, and the favourable attention the Journal has met with in all quarters, we can but hope that the efforts hitherto bestowed will be continued. In return, our very best efforts will be exerted to render our pages valuable and interesting.

Those of our readers whose term of subscription has expired, and who have been, or will be, notified by circular, will confer a favour by responding as early as possible, in order that their copies of the journal may reach them in due course.

BOOK NOTICE.

Electro Metallurgy Practically Treated. (Weale's Rudimentary Series.) Sixth Edition. By ALEXANDER WATT, F.R.S.S.A. London: Crosby, Lockwood, & Co.

THE matter contained in this excellent little volume is both valuable in a practical point of view, and likewise interesting, as it records the many recent improvements which have been made since the first appearance of the work. To those engaged in the arts of electro-gilding, plating, &c., the book will be found of great service, since the author (who has for nearly twenty years been engaged in such branches) has given the results of his own practical experience, which must prove useful to others. The meaning of all technical terms are fully and clearly explained, and a careful perusal of the many processes described will doubtless obviate much trouble and annoyance often experienced. The work commends itself to all requiring information on the subject of electro metallurgy or its kindred arts.

PUBLIC CLOCKS IN VIENNA are at present driven by a pneumatic system, actuated at the Imperial Observatory by an automatic arrangement connected with an astronomical timepiece. The idea originated with an Austrian engineer named A. Mayrhofer, who had long experimented with the transmission of time by means of electricity, and at last gave it up in favour of pneumatic transmission, which is free from the drawbacks and uncertainties connected with the use of electric batteries, insulated wires for transmission, delicate contact breakers, and other complicated arrangements. The method of Mr. Mayrhofer consists in originating a wave of compressed air, which is sent through air-tight tubes laid along the street gas mains to all the public clocks. This wave is transmitted once every minute, when the minute hands of all the clocks move forward the required distance. It is intended to extend this system until it includes the clocks in all the schools, public institutions, hotels, railroad depôts, and the houses of such persons as may desire it.

THE DUTY ON PLATE.

THE *Times* of the 29th ulto. says—Mr. Edward J. Watherston writes from 12, Pall Mall East:—"In a recent article upon 'Free Trade,' there occurs the following sentence:—'We have now no duties whatever except upon articles destined for direct consumption—wine, spirits, tobacco, tea, coffee.' True, with one, and I believe only one, further exception, viz., the tax upon gold and silver plate, of 17s. and 1s. 6d. per ounce respectively. If any proof of the beneficial effects of the principles of free trade were required in support of the arguments contained in your article, the present condition of the silver trade would afford ample proof of the evil effect of *ad valorem* duties. That the trade is becoming 'smaller by degrees and beautifully less' may be seen by the fact that whereas in 1855 duty was paid upon 994,360 ounces, in 1875 the number of ounces had fallen to 886,493. In 1876 there was a further fall. This is not remarkable when it is considered that the duty upon silver spoons and forks is 20 per cent., and upon tea sets, waiters, and other useful plate, 12½ per cent., the tax becoming smaller in proportion as the workman's ship becomes more elaborated—in other words, the greater the luxury, the smaller the tax. It may be said, 'If this be true, why has the tax not been abolished; Mr. Gladstone abolished dozens of duties; taxes have been abolished during the last 40 years in the case of no less than 1200 different articles; why has this tax been retained?' Simply because (1) the cost of collection is nil, the Goldsmiths' Company collect the greater part of the tax; and (2) the manufacturers, with the usual want of foresight of their class, hug the tax for a reason which might, as it should, influence the Chancellor of the Exchequer with reference to its abolition. A drawback is allowed upon unfinished plate of 3d. an ounce. By sending plate to the Hall as nearly finished as possible, a profit is secured to the manufacturers of about 2d. an ounce. A manufacturer, therefore, who works up 120,000 ounces, secures a profit of £1000 a year upon duty alone. This fact speaks for itself. But the duty, as paid by the public, is more than 1s. 6d. an ounce—it is nearly 2s., or two-fifths of the value of the material itself. A manufacturer, with a stock of 50,000 ounces, has a capital embarked in his trade of £3750 for duty alone. He must take this capital into consideration when making his profit. The retailer puts his profit upon the gross. No wonder that the silver trade is kept within the narrowest possible limits. But, Sir, in the interest of art, it is most desirable that the tax should be abolished. In no trade has there been so little progress in art as in the silver trade. Buyers of Goodwood cups would testify to this fact. By reason of the tax but little capital is embarked in the silver trade. Artists turn their attention to furniture, carpets, oilcloths, curtains, papers, decoration, and other trades. I have trespassed already too much upon your space, but I would merely mention that in no other country is there such a prohibition duty upon silver plate. In America there is no tax for home use, and in that country one manufacturer works up more silver than is worked up in the whole of the United Kingdom."

ON THE STUDY OF BAROMETERS.—M. Wickenbreimer believes he has established the following propositions:—The mean of barometrical observations, made at a certain hour, for all the days of a month, gives an uniform figure whatever hour it may be. The barometrical height reaches twice daily its maximum and its minimum. The yearly barometrical mean remains the same for all the hours of the day.

AN INTERESTING "FIND" has been made at St. Triphon, a Swiss market town in the Canton de Vaud, built in the neighbourhood of the alluvial plain which the Rhone has deposited at its entrance into the lake of Geneva. At a few paces from a hut called Lignal, in a field, have been discovered five hatchets of bronze of the best model, with length varying between 17 and 18 centimetres. One of them is broken in the middle. A few pieces of unworked bronze accompanied these precious relics of early industry. The whole weighed about 8 kilogrammes. In the same field have been brought to light the debris of a forge, the hearth of which, still surrounded with carbon, was formed of a piece of sand-stone bearing marks of fire. The nature of the objects thus discovered leaves no doubt of the existence at St. Triphon of a foundry of the age of bronze, similar to the numerous prehistoric establishments of this kind which have already been explored in France, in the Rhone Valley, and in Savoy.—*English Mechanic*.

PATENTS.

Applications for Letters Patent relating to Jewellery, Watches, Clocks, Optical Goods, or kindred articles.

1705. CHARLES HENARD, manufacturer, and ETIENNE LASNIER, both of 1, Rue Lafitte, Paris, France, for an invention of "A new cosmographic clock."—Dated 2nd May, 1877.
1853. LOUIS BEAVER, of Manchester, in the county of Lancaster, goldsmith, for an invention of "Improvements in scarf-rings."—Dated 12th May, 1877.
1880. JOHANN ANTON BENEDICT VON CASTELBERG, of 58, Holborn Viaduct, in the city of London, for an invention of "Improvements in watches."—A communication to him from abroad by C. Domon, of Bienne, Switzerland.—Dated 14th May, 1877.
2026. LOUIS PLATNAUER, of Birmingham, in the county of Warwick, for an invention of "Improvements in fastenings for buttons, shirt studs, solitaires, and other articles of jewellery and dress."—Dated 24th May, 1877.

Notices to Proceed.

29. WILLIAM GILLET & CHARLES BLAND, both of Croydon, in the county of Surrey, clock manufacturers, have given notice in respect of the invention of "Improvements in clocks and other time-keepers."
191. HARRISON MILL FRODSHAM, of the Strand, in the county of Middlesex, Chronometer Maker, has given notice at the Office of the Commissioners of his intention to proceed with his application for Letters Patent for the invention of "Improvements in equi-motive escape-ments for watches, clocks, and other time-keepers."
265. JOHN HOLLOWAY, of the firm of Holloway Brothers, of 7, Jeffrey's Square, in the city of London, has given notice in respect of the invention of "Certain improvements in the production of metals or metallic alloys, and in the process employed therefore."

Inventions protected for Six Months on the deposit of Complete Specifications.

1932. ARTHUR CHARLES HENDERSON, of 6, Southampton Buildings, Holborn, in the county of Middlesex, Patent Agent, praying for Letters Patent for the invention of "Improvements in watches,"—a communication to him from abroad by Julien J. B. Joseph Lebas, watchmaker, of Willerval, in the department of Pas de-Calais, in the republic of France,—was deposited and recorded in the Office of the Commissioners.

Grants of Provisional Protection for Six Months.

29. To WILLIAM GILLET & CHARLES BLAND, both of Croydon, in the county of Surrey, clock manufacturers, for the invention of "Improvements in clocks and other time-keepers."
1451. To JOSEPH GEORGE ROLLASON, of the firm of Rollason, Wood & Co., stampers, piercers, and fancy chain manufacturers, of Birmingham, in the county of Warwick, for the invention of "Certain improvements in solitaires and other like fastenings."
1579. To JOHANN ANTON BENEDICT VON CASTELBERG, of 58, Holborn Viaduct, in the city of London, for the invention of "Improvements in calendar watches."—A communication to him from abroad by Fritz Petitpierre, of Chaux de fonds, Switzerland.
1522. To HENRY STUART, of Liverpool, in the county of Lancaster, watch manufacturer, and GEORGE DANIELS, of the same place, watchmaker, for the invention of "Improvements in mechanism for winding and for setting the hands of keyless time-keepers."

Patents Sealed.

4811. JOHN COMPTON WEEKS JEFFERYS, of Tottenham-court-road, in the county of Middlesex, manufacturing jeweller, for an invention of "Improvements in studs, solitaires, purses, clasps, gloves, bags, harness, and other fastenings or ornaments for dress."—Dated 13th December, 1876.
4447. ALEXANDER LESLIE FYFE, of Aldersgate-street, in the city of London, for an invention of "Improvements in shirt studs and dress fastenings."—Dated 17th November, 1876.
419. ALFRED VINCENT NEWTON, of the Office for Patents, 66, Chancery Lane, in the county of Middlesex, Mechanical Draughtsman, for an invention of "An improvement in watch movements."—A communication to him from abroad by the Elgin National Watch Company (Incorporated) of the city and state of New York, United States of America.—Dated 31st January, 1877.

Patents which have become Void.

1442. JOHN WILLIAM WIGNALL, of Manchester, in the county of Lancaster, for an invention of "Improved self-winding apparatus for clocks, musical boxes, and other similar purposes."—Dated 25th April, 1874.

1492. HENRY JOHN BROOK, EDWARD GOODRICK DRAPER, & JOHN UNWIN, all of Sheffield, in the county of York, electro-platers, for an invention of "Improvements in the preparation of articles to be electro-plated or coated with nickel and other metals by electricity."—Dated 29th April, 1874.

1697. FRIEDRICH HOLTERMANN, of Hamburg, in the empire of Germany, Manufacturer of Jewellery Cases, for an invention of "Improvements in cases for jewellery, watches, and other articles."—Dated 13th May, 1874.

Certificates of Addition.

98,748. BESANÇON & BAUMANN, for "Safety studs for cuffs."—Dated 7th December, 1876.

115,867. RICHARD, for "An aneroid barometer."—Dated 9th December, 1876.

Patents Granted in British Colonies and Dependencies.

CANADA.

7106. JOHN HOLLOWAY, of London, Eng., for "A process for producing metals or metallic alloys." (Procédé pour produire des métaux ou alliages métalliques.)—5 years.—Dated 21st February, 1877.

Patents Granted in Foreign States.

FRANCE.

115,784. BREGUET, for "A system of multiple contact, applicable to electric clocks, second counters, and other apparatus."—Dated 18th November, 1876.

115,867. RICHARD, of Paris, for "Improvements in the construction of aneroid barometers."—Dated 5th December, 1876.

115,880. CONON, for "Electric clockwork."—Dated 7th December, 1876.

115,890. GUYE & BARBEZAT, for "A calendar-watch."—Dated 7th December, 1876.

115,907. THODON, for "Improvements in clasps or fasteners for dresses."—Dated 7th December, 1876.

115,925. JARY & MILLOT, for "A repeating clockwork applicable to all clocks, alarms, &c."—Dated 9th December, 1876.

115,935. RECLUS, for "Improvements in aneroid barometers."—Dated 8th December, 1876.

115,972. SIEGER, for "Artificial ivory, called 'ivorite.'"—Dated 11th December, 1876.

115,976. BAZIN, of Paris, for "An electric motor."—Dated 14th December, 1876.

115,984. DELCAMPRE, of Maisons-Alfort, for "An electric bath for applying metals in several layers."—Dated 13th December, 1876.

115,985. DELCAMPRE, of Maisons-Alfort, for "A battery for obtaining metallic deposits and for other purposes."—Dated 13th December, 1876.

UNITED STATES OF AMERICA.

183,802. A. C. GREENE, of Providence, R.I., for "Jewelry-settings."—Application filed 11th October, 1875. *Claim*.—"A holder for receiving a stone or other ornamental jewelry-setting, which consists of a single piece of sheet metal, formed into a border, a backing which affords a foundation for the rear of the stone, and a suitable number of setting-points projecting from the inner line of the border for engaging with the stone, substantially as described."

183,867. HENRY A. ROSENTHAL, of Brooklyn, N.Y., for "Watch-protectors."—Application filed 16th September, 1876.

183,966. ZEPHANIAH PHILLIPS, of Bridgeport, Ohio, for "Time-locks."—Application filed 23rd September, 1876. *Brief*.—"A series of bolts are thrown outward by means of one set of springs, and are retracted by another or stronger set of springs. The retracting-springs are prevented from acting upon the bolts until released by means of a time mechanism."

BELGIUM.

41,982. G. E. PRITCHETT, for an imported invention of "Synchronous clocks, &c."—Dated 16th April, 1877.—(English Patent, 28th September, 1876.)

SAXONY.

4790. V. POPP, E. RESCH, & C. A. MAYRHOFER, of Vienna, for "Pneumatic clocks."—5 years.—Dated 20th February, 1877.

SWEDEN.

112. S. J. JOHNSON, for "A mechanism for winding up clocks."—4 years.—Dated 4th July, 1876.

183. A. G. BJORKMAN, for "A safe for gold and silver coin."—3 years.—Dated 30th September, 1876.

184. A. G. BJORKMAN, for "Improvements in studs."—3 years.—Dated 30th September, 1876.

Designs Patented in the United States.

9609. JAMES WILKINSON, of Mount Vernon, N.Y., for "A breastpin."—Application filed 4th October, 1876.—Term of patent 3½ years.

9610. JAMES WILKINSON, of Mount Vernon, N.Y., for "An ear-ring."—Application filed 4th October, 1876.—Term of patent 3½ years.

MONTHLY RECORD OF BANKRUPTCIES.

Declarations of Dividends, Dissolutions of Partnerships, Scotch Sequestrations, &c., &c., relating to the various Trades represented in this Journal.

Liquidations by Arrangement or Composition.

SWINBURN, THOMAS, Market-place, Whitehaven, and Wilson-street, Workington, clock and watchmaker. May 3. J. McKelvie, sol., Whitehaven.

WINSPEAR, JOHN EMANUEL, Hull, optician and beerhousekeeper. April 30. Roberts & Leak, sols., Hull.

ASHER, ASHER, 26, Park-road, Newcastle, jeweller and general hawker. May 7. J. G. & J. E. Joel, sols., Newcastle.

ATKINS, WILLIAM HENRY, 10, Key-hill-drive, Birmingham, jeweller. May 12. E. Jaques, sol., 40, Cherry-street, Birmingham.

COUSSENS, RICHARD WILLIAM, trading as COUSSENS & SONS, Wind-street and Gorse-lane, Swansea, optician and jeweller. H. Tyrrell, sol., 14, Gray's-inn-square.

HENDERSON, HODGSON, 5, Dobing-street, Stockton, jeweller. May 11. J. Trotter, sol., Stockton.

HOTT, JOSEPH HENRY, trading as JOSEPH H. HORE & Co., Hylton-street, Birmingham, watch manufacturer and jewellers' factor. May 8. E. Jaques, sol., 40 Cherry-street, Birmingham.

ISAACS, ISAAC, 54, Gower-street, Bedford-square, dealer in silver plate and diamonds. Apr. 24. C. V. Lewis, sol., 19, Moorgate-street.

JOEL, HARRY, 9, Hall's-street, Birmingham, jewellers' factor. May 10. E. Jaques, sol., 40, Cherry-street, Birmingham.

MANNHEIM, MARK, 41, Stafford-street, Liverpool, jeweller. May 11. Nordon & Mason, sols., 7, Victoria-street, Liverpool.

MARKE, SIMON, 31, Westmoreland-terrace, Newcastle, jeweller. May 5. J. G. & J. E. Joel, sols., Newcastle.

THOMAS, JOHN, Market-square, Llandover, watchmaker. May 8. J. B. Clarke, sol., Waterloo-street, Birmingham.

CHERRY, ROBERT, Spennymoor, Durham, watchmaker and retailer of beer. May 17. J. Patrick, jun., sol., Bishop Auckland.

DEACON, JOSHUA PHILLIPS, 1, Cambray, Cheltenham and Woodinapcote, silversmith, &c. May 18. J. M. Clark, sol., Cheltenham.

ROGERS, WILLIAM GIFFORD, trading as WILLIAM FREDERICK ROGERS, Ryland-road, Edgbaston, Birmingham, jeweller, &c. May 7. G. Joynt, sol., 90, New-street, Birmingham.

SEALEY, JOHN R., Frizington, Cumberland, jeweller. May 14. E. Atter sol., Whitehaven.

CARR, FREDERICK DALZELL, Rotherham, late Sheffield, metal broker, May 25. At R. Marsh's 8, Westgate, Rotherham, June 11 at 12. W. Pollard, sol.

FOSTER, JOHN, jun., Highfield, Sheffield, jeweller. May 25. At J. & G. E. Websters, sol. Sheffield, June 11 at 3.

NICHOLL THOMAS, Camborne, Cornwall, watchmaker, &c. May 24. At Buller's Arms Hotel, Redruth, June 11 at 11. R. H. Holloway, sol. Redruth.

SEALEY, JOHN ROBINSON, Chapel-road, Frizington, jeweller. May 22. At A. H. Foster, 13, Bennett's-hill, Birmingham, in lieu of the place original named.

SEWELL, JOHN WILLIAM, Westgate, Grantham, watchmaker, May 22. At D. Whittingham's, sol. Nottingham, June 23 at 12.

Trustees Appointed.

BANES, EBENEZER and JOHN MANSON, trading as E. BANES & Co. (Liq.), Queen-street, Cheapside, jewellers. Tr., W. C. Harvey, 1, Gresham-buildings, London, and W. H. Brown, 17, Ann-street, Birmingham.

RAVENSCHROFT, GEORGE H. O. (Liq.), Dover, jeweller. Tr., E. Davis, Birmingham, jeweller, and W. C. Harvey, Gresham-buildings, Basinghall street, accountant.

RAY, ELIZA S. and EDWIN S. HARRISON (Liq.), Great Castle-street, Regent-street, jewellers. Tr., R. Webb, 86, Newman-street, Oxford-street, and J. A. Norman, 5, Margaret-street, Cavendish-square.

Trustees and Commissioners Appointed in Scotland.

LINZ, RUDOLPH, Greenock, watchmaker. Tr., J. H. Ferguson, Glasgow, acct. Com., J. Rodger, Greenock, agent for Clydesdale Banking Co., and J. Scouler, 64, Buchanan-street, and J. Gardiner, jeweller, both Glasgow.

Scotch Sequestrations.

LINZ, RUDOLPH, Greenock, watchmaker. May 11. Claims by Sept. 3. Agent G. Williamson, 2 Bank-street, Greenock.

Dividends under Sequestrations.

SERVICE, JOHN, Newton-Stewart, Wigton, watchmaker, &c., equalizing. W. D. Quick's, 75, Bath-street, Glasgow, on and after May 26.

BARNETT, JOHN, Argyle-arcade, Glasgow, jeweller.

BARR, MATTHEW J., Glasgow, Jeweller. 1st and final, W. D. Quick's, 75, Bath-street, Glasgow.

Adjudications of Bankruptcy.

MARKE, SIMON, 31, Westmoreland-terrace, Newcastle, jeweller. May 26. At C.C., Newcastle, June 12 at 11. Mortimer, Reg.

Dissolutions of Partnerships

CORNFORTH & KELSEY, trading as HENRY CORNFORTH, Newhall-street, Birmingham, electro platers. Mar. 31.

HENNELL, ROBERT & SONS, 86, Charlotte-street, Fitzroy-square, silversmiths. Mar. 31.

GLASGOW JEWELLERY COMPANY, 41, Oswald-street, Glasgow. May 3.

ESPIE & ARTHUR, 4A, Eglinton-street, Glasgow, watchmakers, &c. May 15. Debts by Andrew T. Espie, who continues the business.

BAGLEY & HIPWOOD, Regent-parade, Birmingham, silversmiths and manufacturers of electro plated wares. April 21.

BARNARD & CRABTREE, Arlington-street, Clerkenwell, watch and chronometer manufacturers. April 18. Debts by James T. Barnard.

DILGER & KAISER, 30, Park-terrace, Regent's-park, watch and clock makers. March 25.

SLACK & LATHAM, Snape-street, Birmingham, jewellers. April 17. Debts by John Latham.

Distribution of Assets.

FUTTER, CHARLES A., Johnson's-court, Fleet-street, jeweller, died April 23. Claims by June 20 to Thomas & Edwards, 57, Moorgate-street, sols.

GOLDING, WILLIAM G., Commercial-street, Pontypool, watchmaker, died March 22. Claims by July 6 to Greenway & Bytheway, Pontypool, sols.

Meetings.

HODKINSON, HENRY, GEORGE H. LESTER, and HENRY POYNTON (Bkt.). Coventry, metal workers. At Castle Hotel, Coventry, June 12 at 12. To consider an application to be made by the trustee, for his release.

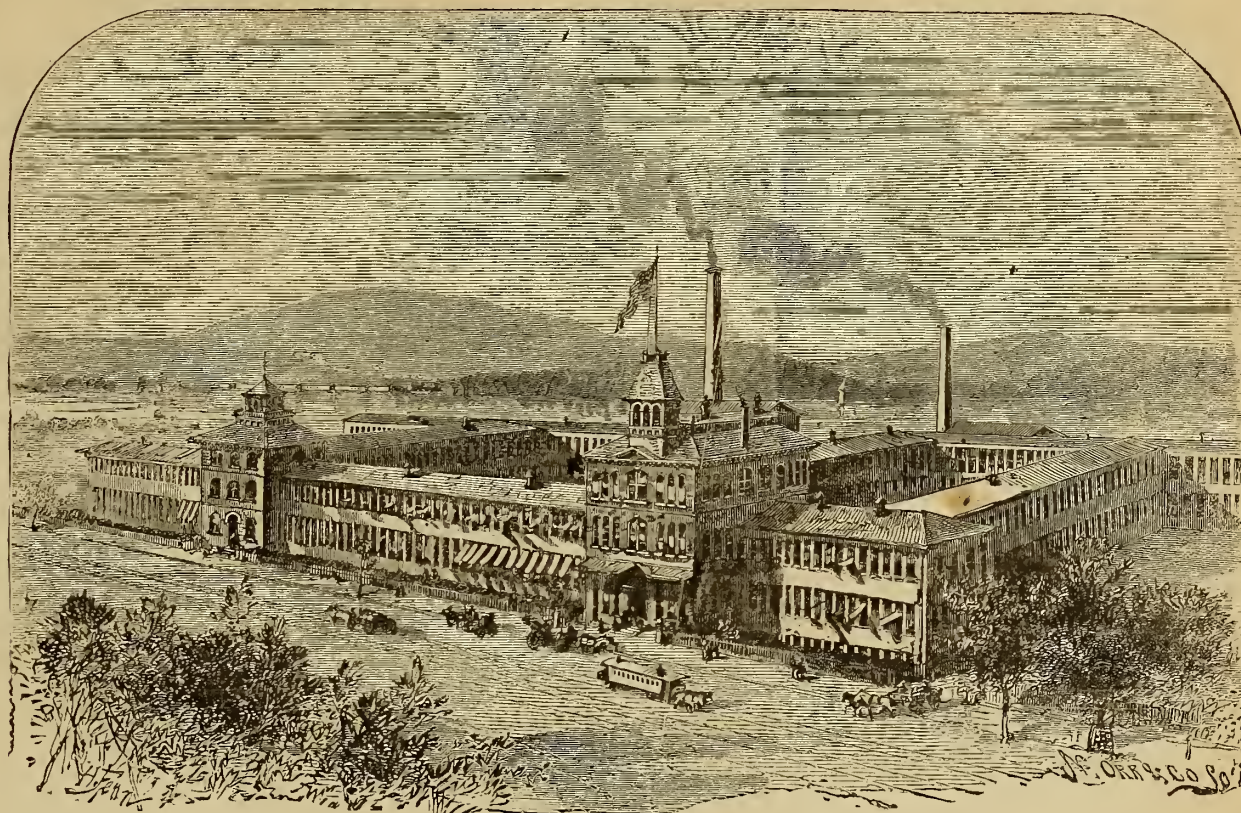
MARKE, HENRY (Bkt.), Newcastle, jeweller. At J. G. & J. E. Joel's, sols., Newcastle, June 9 at 2. Consider composition 2/.

ARTIFICIAL PEARLS.—Some curious specimens or artificial pearls, the joint work of the Chinaman and the oyster, have just arrived at Paris. These pearls are well known at Ning-po, but their entirely artificial character has only recently been discovered. The mode of manufacture does credit to the intelligence and ingenuity of the "heathen Chinee." He introduces into the shell of the oyster little pieces of wood or earth, which keep the unhappy mollusc in a constant state of irritation, and cause a pearly section, which ultimately covers the fragments. Often a piece of metal shaped to resemble the figure of Buddha is introduced into the shell, and this, by a similar process, is converted into a pearl, possessing all the conditions of a presentable relic that finds a ready sale, and for which there is, it seems, a large and growing demand.

PLATE TAX.—An order was made in the House of Lords in May, 1776, "That the Commissioners of His Majesty's Excise do write circular letters to all such persons whom they have reason to suspect to have 'plate,' as also to those who have not paid regularly the duty on the same." In consequence of this order the Accountant-General for household plate sent to the celebrated John Wesley a copy of the order. John's answer was laconic:—"Sir, I have two silver teaspoons in London and two at Bristol. This is all the plate which I have at present; and I shall not buy any more while so many round me want bread, I am, sir, your most humble servant, JOHN WESLEY."

THE THIRD VOLUME of this JOURNAL will commence with the ensuing (July) number. Subscribers should be careful to renew in time in order that they may receive the complete Volume. All Orders should be made payable at the Lombard Street Post Office. Stamps sent for renewal of subscriptions must be considered at the risk of the sender. Post Office Orders are in all cases preferred.

"By hand-labour it is impossible for this country to compete with Switzerland in the Watch Trade; and, if we would hold our own in Europe in this branch of industry, we must follow the example of the Americans, who have successfully used machinery in the manufacture of Watches."—*Extract from the "Times" of December 18, 1868.*



"The section which conspicuously brings out the enormous strength of America as a producing power is that of tools; and still more especially the vast array of machine tools for metal, which are the parents of all other machines—more than 100 exhibitors have each a group that commands the admiration of all who take the trouble to examine them in detail. These tools are for all purposes: small arms, sewing machines, clocks, watches, and all branches of machine making and engineering, and almost all are finished in a style superior to that of any former exhibition. Probably the most exquisite set of machine tools ever made is that exhibited by the American Watch Company, of Massachusetts. No mere words can convey an idea of their high standard of excellence; they must be felt and handled. What the Whitworth gauges are to true circles, these lathes and tools are to all forms required in the manufacture of watches. Add to this, great convenience in arrangements and fixtures to produce the parts of a watch so exact as to be almost interchangeable."—*The Times*, October 28th, 1876.

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NEGRETTE & ZAMBA, Holborn Viaduct, E.C.; Charterhouse Street, E.C.; 45, Cornhill, E.C.; 122, Regent St. W.
WEBSTER, J., 88, St. John Street Road, Clerkenwell, E.C.

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PHILLIPS & SON, Speedwell Works, Sherborne Street, Birmingham.
THE SICKER SAFE AND STRONG ROOM COMPANY, LIMITED, Soho, near Birmingham.
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MAYER A. & SON, 122a, Aldersgate Street, London, E.C. Importers of American, French, German, and Cuckoo Clocks, Materials, &c.

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JEWELLER'S MATERIALS.

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JOSEPH, B. H. & Co., 20, Frederick Street, Birmingham. Manufacturers of the Registered "Standard" Sizes for Jewellers.
HUMPHREYS (JOHN A.), 23, Wilderness Row, Clerkenwell, E.C. Jewellery, Chains, Wedding Rings and Keepers, &c.
LAWSON (P.) & GODDARD (C. GILBERT), Manufacturing Goldsmiths, Wholesale Jewellers, Clock and Bronze Importers, Dealers in Precious Stones, and also English, American, and Geneva Watches, 5, Hatton Garden, London, E.C.
BASNETT, S., 29, Augusta Street, Birmingham. Manufacturer of Coloured Gold, Jewellery, Sets, Brooches, Earrings, Pendants, Bracelets, Pins, Crosses, Slides, &c.
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SWINDEN & SONS, 27, 28 & 29, Temple Street, Birmingham.
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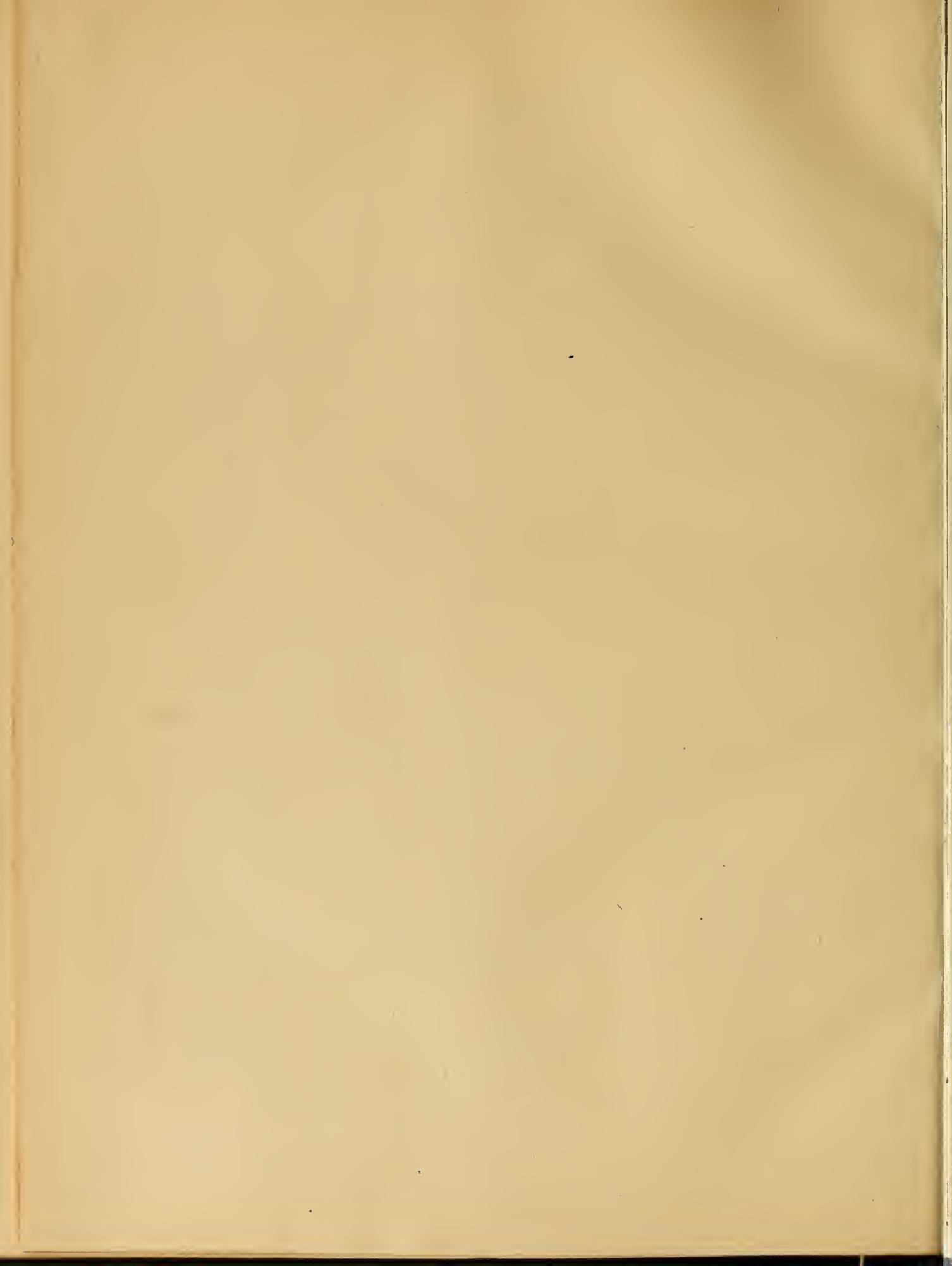
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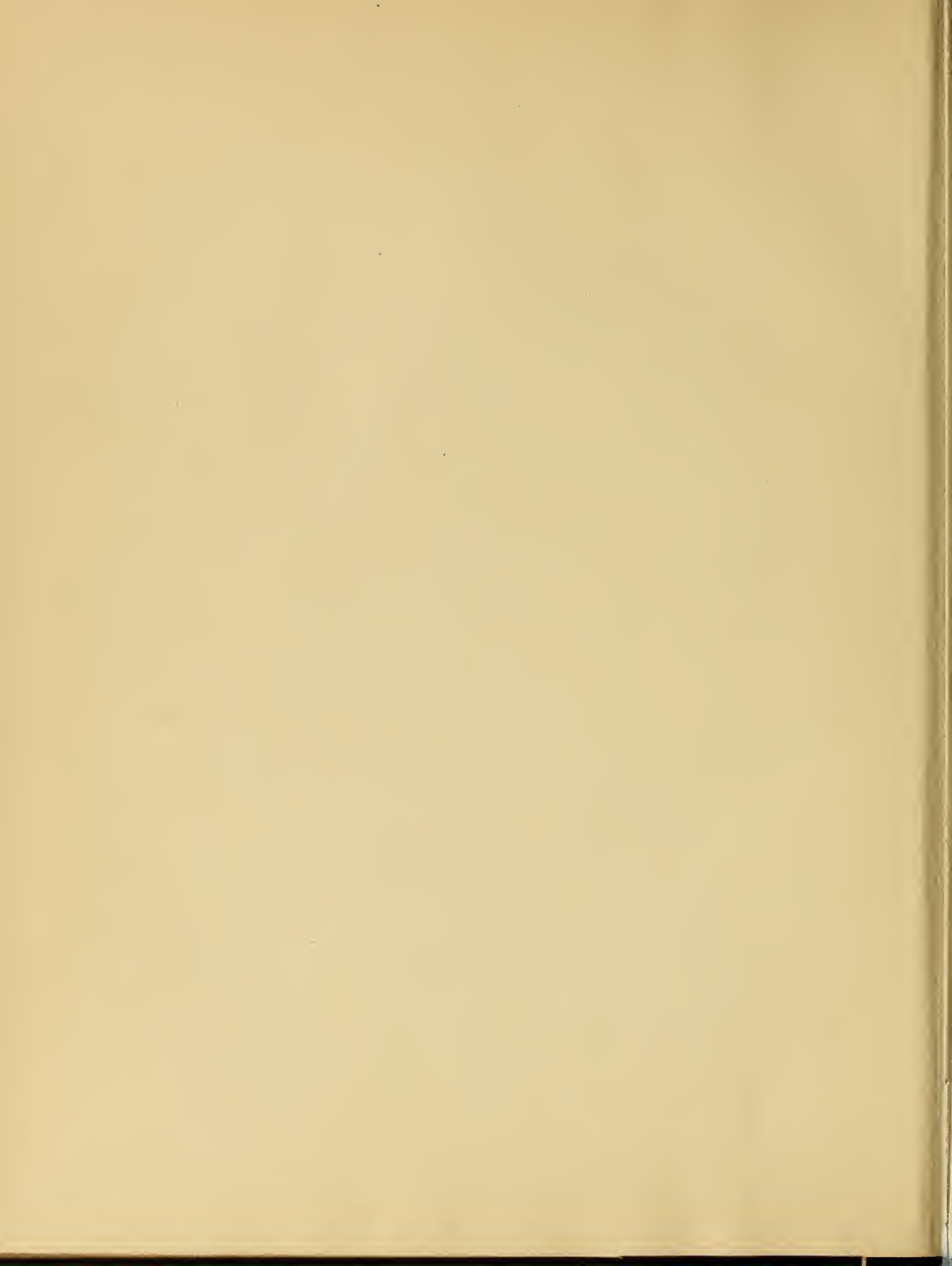
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